PRINT IN BINDING

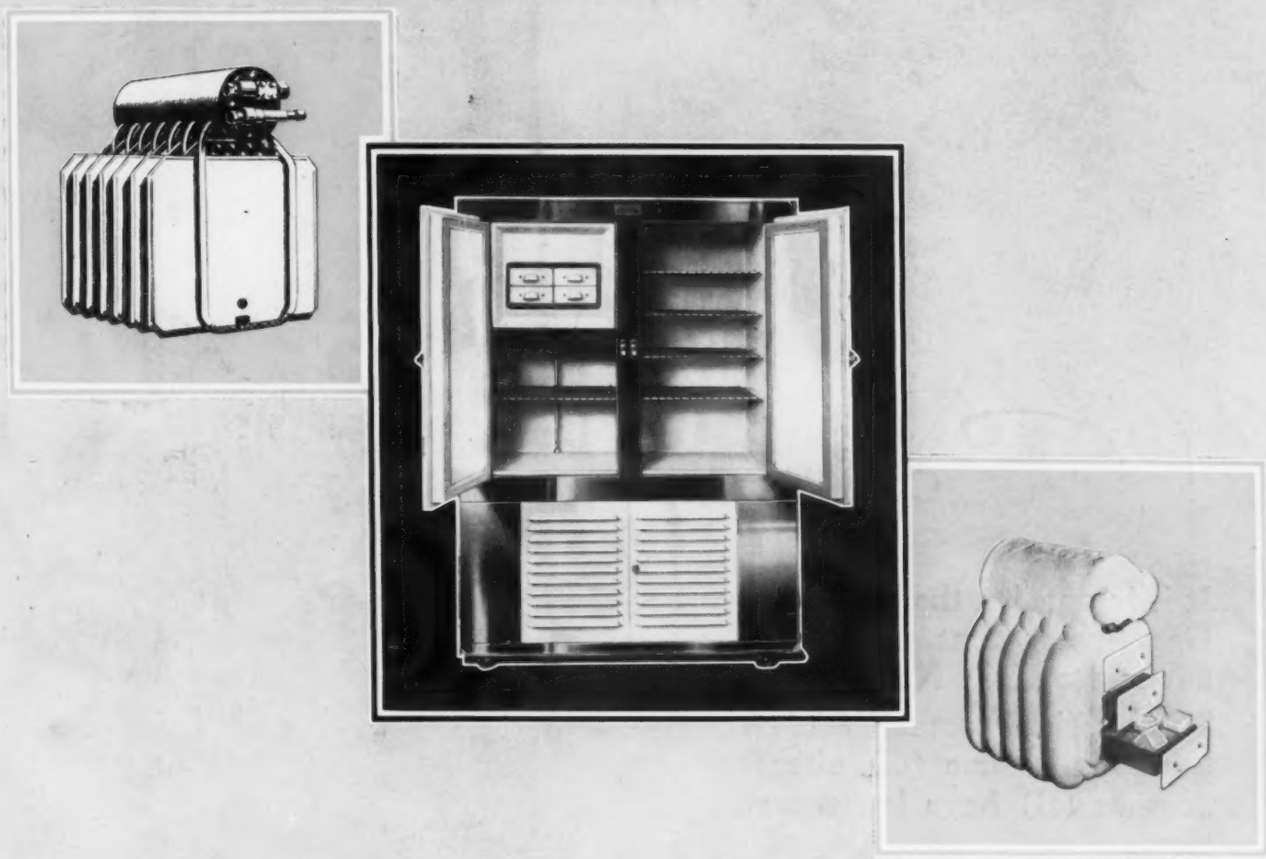
JUNE 1, 1927

Electrical West

With which is consolidated the Journal of Electricity

McGraw-Hill Publication

Twenty-five Cents Per Copy



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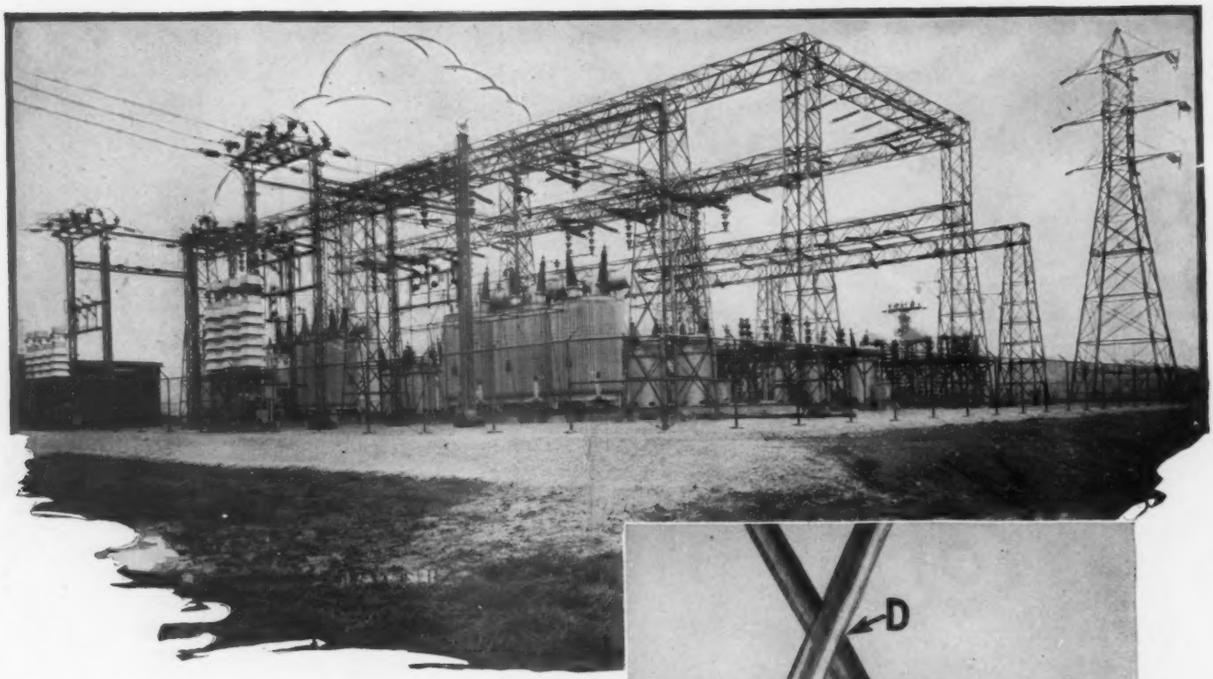

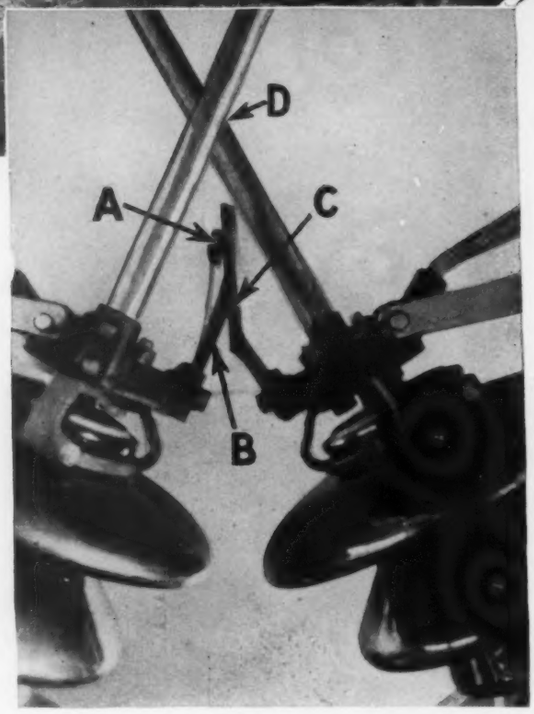

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Electrical West entered as second class matter at the post office at San Francisco, under the Act of Congress, March 3, 1879. Published at 883 Mission Street, San Francisco, California, thirteen times a year as follows: January 1, February 1, March 1, April 1, May 1, May 15, June 1, July 1, August 1, Septe mber 1, October 1, November 1 and December 1.

©ClB 742837

Volume 58 San Francisco, June 1, 1927 Number 7

Electrical West

With which are consolidated the "Electrical Journal," the "Journal of Electricity, Power & Gas," and the "Journal of Electricity"

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A McGraw-Hill Publication
Established 1887

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McGRAW-HILL COMPANY OF CALIFORNIA—883 Mission St.—SAN FRANCISCO
Northwest Office: 1206 Spalding Building, Portland, Ore.
Publishers of ELECTRICAL WEST

JAMES H. McGRAW, Chairman of the Board — C. T. HUTCHINSON, President — EDGAR KOBAK, Vice-President — ROY N. PHELAN, Secretary & Treas.

WASHINGTON, Colorado Building
CHICAGO, 7 South Dearborn Street
PHILADELPHIA, 1600 Arch St.
CLEVELAND, 401 Guardian Building
ST. LOUIS, Southwestern Bell Te ephone Bldg.
NEW YORK, 285 Madison Ave.

Subscription rates in United States, Canada, Mexico, Porto Rico, U. S. Possessions, Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Nicaragua, Panama, Guatemala, Paraguay, Peru, Honduras, Salvador, Uruguay, and Spain, $2.00 per year, 2 years $3.00. Elsewhere $3.00 Gold (13 Shillings). Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Copyright, 1927
By McGraw-Hill Company of California

Entered as second-class matter at the Post Office at San Francisco, under Act of March 3, 1879.

Printed in U. S. A.

Circulation of this issue 6,350

McGRAW-HILL PUBLISHING COMPANY, Inc.
New York
Publishers of
American Machinist—European Edition
(*Published in London*)
Industrial Engineer
Electrical Merchandising
Chemical and Metallurgical Engineering
American Machinist — Construction Methods
Electrical World — Electric Railway Journal
Engineering and Mining Journal
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JUN14'27 1

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C. T. HUTCHINSON
Editorial Director

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G. C. TENNEY
Managing Editor

Volume 58 | San Francisco, June 1, 1927 | Number 7

Making the Most of the Two Forthcoming Conventions

ELECTRICALLY speaking, this month is the most important in the year. Two big conventions, those of the Pacific Coast Electrical Association and the Northwest Electric Light and Power Association, held at Santa Cruz, Calif., and Salt Lake City, Utah, respectively, constitute the culmination of a year's patient effort in study and research for the purpose of striving to turn out a better job.

Recently the convention idea has been somewhat under fire. Executives have been inclined to question whether the "conventioneers" made the most of their opportunities, whether the expense to the companies was justified in terms of value received.

Fundamentally, there can be no question as to the value of conventions. Their objects, purpose and opportunities are too obvious to require repetition here. The fault, if any, lies with not all of those who attend, but with a few—a very small percentage. They are the ones who seem to be conspicuous. They are like the bad news that always figures in the newspapers, and they are the ones who will kill the convention idea if ever it is killed.

However, it is not fair to kill a patient just because he may have a boil on his neck. Lance the boil, and help the patient to recovery. It is not difficult to locate those who make of the opportunity to attend the conventions an excuse to indulge in a protracted joyride at somebody else's expense. They advertise their own proclivities entirely too well. Apply the lance, when the next convention comes around, and establish the principle that the privilege of attending the convention is an honor that involves the acceptance of a responsibility that has to be made good.

Of entertainment the committees have provided generously. There is no "all work and no play" idea in the general scheme of things. The programs provide nicely balanced rations of work and fun, and there will be enough of the latter to make the four or five days of relaxation an unalloyed pleasure, so the fate of the "conventioneer" of the future rests squarely on his own shoulders, while for the executive we recommend the selective method of determining upon who shall be the convention delegates, keeping in mind that justice should be tempered with mercy, and that even executives were young once themselves.

A Sales Record Not Made by a "Real" Salesman

VARIOUS qualifications of automobile, typewriter, insurance, bond, real estate, specialty and many other types of salesmen have been cited by authorities to prove that such men are qualified to sell electrical appliances. In contradiction to this feeling that the power companies must go outside their own ranks to recruit the men to do their selling jobs, the statement has been made frequently in these columns that salesmen should be recruited from the ranks of the companies themselves. This has been based upon the belief that a man who has a full understanding of the problems and responsibilities of his company and a knowledge of the service it has to render is better equipped to sell this service through the medium of electrical merchandise than a complete outsider who could only qualify as a "salesman."

In proof of this contention we submit a statement from the commercial manager of a California gas and electric company. He says: "The first of March we changed one of our salesmen, putting on a new man who was formerly a gas fitter. During the month of March he sold 22 electric ranges, five water heaters, one refrigerator and one electric motor. I thought such a remarakable record would be of interest to you, particularly because it was made by a man who never has sold before."

Between the lines of this brief statement is a wonderful story of salesmanship that in all probability never will be told. Even this brief report, however, ought to serve as an incentive to others engaged in selling kilowatt-hours to the public through the medium of electrical appliances.

California Proves its Progress in Rural Electrification

SINCE THE inception of the national rural electrification movement a few years ago, California has been referred to constantly as the state where greatest progress has been made in the application of electricity to the problems of the farmer. As a matter of fact, for many years California electrical men have taken great pride in this achievement, and like other California "boosters," native sons or not, have had their statements about it accepted by the industry with a plentiful sprinkling of salt. With the organization of the California Committee on the Relation of Electricity to Agriculture in 1925 one of the first studies programmed was a survey of the present uses of electricity on California farms. Not only was this undertaken as a check upon the statements that had been made frequently, but it also was believed that such a survey would prove immensely valuable to committees and utilities in other states where rural electrification was being given serious consideration.

After almost two years of work the results of this survey have been made public and are reported on another page of this issue. Checks and counterchecks have been made, and the resulting information is considered to be reliable and conservative.

Among the interesting facts brought out by the survey is the multiplicity of uses to which electricity is put by the farmer. These include all of the common domestic applications as well as many power applications. Records of the power companies show that in 1925 there were 210,000 electric consumers classed as

rural. By applying the strict definition used by the census bureau in determining whether or not a rural property is a farm, the total number of agricultural consumers was found to be 51,000 or 40 per cent of the farms in the state. The connected agricultural power load was 635,913 hp.; the consumption of energy for power purposes was 712,947,847 kw-hr. and the revenue from power load $11,010,694.15. The average connected power load per farm was 15.77 hp.; the average annual consumption for power only was 17,652 kw-hr., and the average annual revenue per consumer was $273.08. For energy used for power purposes alone the farmers paid an average of .0154 cents per kw-htr. Further study of the survey will reveal many other interesting facts. That the survey covers the years 1925 is a factor that should not be overlooked. If the normal growth percentage for the power companies applies to this type of service the figures presented ought to be increased by at least 10 per cent to give the present extent of the application of electricity on the farm.

Those in charge of the survey are to be congratulated upon the thorough manner in which the study was completed. Not only does it serve to check the statement that in no other section of the world has such progress been made in rural electrification, but it serves as a basis for data for other sections of the country where the farmer has been less fortunate than his California brother in the enjoyment of the benefits and conveniences of electricity.

Lighting Now May Come Out of the Kitchen

IF LIGHT has come into the home via the back door and the kitchen, it is time, surely, for it to emerge into the parlor. Not that electric light has not been used for years in the home in some more or less crude form. It has. There is still a multitude of drop cords to bear evidence to that fact. The figures on wired homes in the Western states are figures relating directly to the use of electricity in the home primarily, and in most cases completely, for illumination—such as it is.

Beginning two years ago, in some cases earlier, the central stations of the West decided that the logical point of attack for home relighting was the kitchen. Accordingly, more or less elaborate programs on kitchen lighting were carried out, depending upon the commercial manager's grasp of possibilities in his field. Several interesting records have been chronicled in the pages of this publication, some almost phenomenal in their results.

The most surprising thing about these programs, especially disconcerting to those who shortsightedly opposed such work at the time of the kitchen-lighting campaigns, was that all branches of the industry were benefited. In one instance alone three of the largest jobbers, during the first six months of the year previous to the kitchen-lighting campaign of the Pacific Gas and Electric Company, sold 3,900 kitchen units to dealers. In the last six months of the same year, during the power company's campaign, they sold 16,000 units to dealers and 30,000 to the central station. In the next year they sold to dealers 27,500 and to the power company 15,300. In two years the power company sold 45,300 and the dealers 47,400 kitchen units. During the past year the dealers sold twice as many as the power company and six times as many as they sold before the power company began its campaign. New homes in the territory served by that company are built almost exclusively with kitchen units installed.

A similar and much more extended opportunity awaits the industry in campaigns for refixturing the other rooms of the house. The kitchen light has proved its case. Its success has paved the way for the introduction of genuine illumination into every room of the home. The reaction away from ceiling fixtures which has been felt for the past two or three years is merely an indication that the old type of ceiling fixture with the curves and ugly glassware, and its successor, the bare lamp fixture, have not measured up in illumination or eye comfort to the unit which has come into the kitchen.

There is every need for a new activity in home lighting, an activity designed to bring correctly shaded and distributed light to every room in the home. Even now the more progressive illuminating men are preparing programs of this character. Remembering the effects of the kitchen-unit campaigns in increased business for every branch of the industry, it will be well for the entire industry again to swing into step with these programs. Nowhere should there be offered such passive resistance as was often encountered during the previous campaigns. Such resistance cost many campaigns a great deal in energy lost in overcoming momentum, energy which might better have been employed to bring still greater results to all concerned, even to those who offered that resistance. The entire industry should present a united front in this next invasion of the home to the end that the figures for wired homes of the West should not merely be representative of drop-cord conditions but rather of well and comfortably lighted homes.

It Wasn't So After All

NEITHER the cost of wiring nor yet the cost of electricity is to be charged with holding back electrical development. Such is the conclusion, virtually, to be formed from a survey of all evidence submitted in the recent Industry Conference on Wiring. Instead it is to lack of sales effort and educational work on the value of complete wiring that must be laid the blame for the apparent slowness of electrical growth in certain parts of the country. And for this condition neither the electragist, the central station, nor yet the manufacturer or jobber is to blame, individually. As an industry all are to blame *in toto*.

Now that the air has been cleared of recrimination, of charge and countercharge, the industry finds itself healthy once again, purged of suspicion and bad faith, and ready to look at a common problem, not as a job for one member of the family alone but as something to which the efforts of all members must be devoted in harmonious accord.

One thing is certain. One must not toss out idle statements as to the intents and purposes of the gamin of the electrical family, the contractor. He is to be regarded no longer as a freckled-faced street urchin. He rises in his dignity as an Electragist and, not unlike the classic example, astounds the elders with the depth of his wisdom. Not only did the Electragists present a most thorough and convincing case but they established quite definitely, with complete cost data to back up every statement, that wiring in flexible metallic conduit, because of the saving in labor cost, is less costly to install than the well known knob and tube. So convincing was their case, indeed, that protest as to wiring costs boiled themselves down to mere dissatisfied grumblings that there was "no question of the cost of labor or material or overhead or profit to the contractor but customers just wanted lower cost of wiring."

From the electrical leagues, non-partisan to the argument, came the most disinterested testimony and constructive suggestion. Almost universally they reported that the most effective way to set up adequate wiring and rewiring plans, including refixturing programs, would be by sales campaigns and educational effort.

Out of it all has come realization that the extension of electrical service facilities is an industry job; that the definite position of the Electragists as to metal wiring must be made known, both by the contractors' organization to its own craft and by the National Electric Light Association to its members; that overzealousness toward the promotion of too rigid wiring requirements should not be carried to the point of coercion; but more important than all, that the four branches of the industry should call a new conference in July to formulate "a program for the promotion of the domestic market for house-wiring, electric service and electric equipment in the homes of America."

Those who know of the constructive work done in the West by Clyde Chamblin are certain that under his leadership the Electragists may be expected to do their part in arriving at a mutual understanding and in formulating a program. That the other branches of the industry will take similar steps cannot be doubted by anyone who knows the industry and its growing appreciation of good will and fair dealing.

Power Company Merchandising Policies

A NEWS item in this issue tells of a loss sustained by the Seattle City Light Department in merchandising in 1926. On presentation of the comptroller's report the mayor ordered an investigation, and the attendant publicity caused a murmur of complaint to emanate from electrical dealers, who realized that not only were they forced to compete in their own business with a merchandising policy which created a condition of unfair competition but also that as citizens and taxpayers they ultimately would have to pay such losses. After a little flurry of excitement in official circles the affair died down and was heard of no more.

The Seattle incident, unimportant in itself, is a manifestation of the increasingly insistent complaint against power-company merchandising policies in Pacific Coast cities. This complaint finds expression in two forms. First, electrical dealers and other merchants with electrical appliance departments have objected to power companies selling certain appliances at too short a margin to cover all items of selling expense and at too long terms. It is claimed that such prices and terms cannot be met by dealers who must make a fair merchandising profit to stay in business. Second, the complainants have attempted to strengthen their cases by raising a point alleged to be in the public interest: that by such selling methods losses are sustained which tend to keep rates up, since such losses must be absorbed by profits from other operations.

It is true that companies have sold some appliances at less than a normal retail margin of profit, have granted long-time credit and have offered other inducements to customers to buy and use such appliances. Generally this has been done in the case of appliances requiring an excessive amount of pioneering, such as the electric range, and if some such policy had not been adopted a negligible number of ranges would have been sold because no other element of the industry would have undertaken the pioneering risk and expense. In the case of the range a great deal of extra wiring has gone to those contractors who have had the vision to tie in as closely as possible with the power company's merchandising plan; and in addition the popularizing of other appliances through range sales has redounded to the benefit of the entire industry.

Lately in some localities power companies have deemed pioneering methods of merchandising no longer necessary, have raised range prices to list and otherwise have adjusted sales policies to promote and foster dealer co-operation. They have done this in the belief that such action will be conducive to securing a maximum number of appliances on their lines which, rightly, is the determining factor in the establishment of a merchandising policy, since the best interests of the electrical industry and the public alike are served by a policy which saturates the power-company lines with current-consuming devices.

This brings us to a consideration of the second form of complaint, which attempts to draw the public into the controversy. Whether a company shows much, little or no profit on its merchandising activities may be largely a matter of bookkeeping and is of little or no import to the public, except that when a power company has been an active merchandiser the effect has been beneficial to the public rather than otherwise. Merchandising efforts, whether they have produced a black or red balance at the end of the year, have produced load, sold kilowatt-hours, raised load factors, and, withal, have had no little effect on reducing rates; and it is doubtful if any claim to the contrary in any individual case could be substantiated.

Politics and Water Power Development Reviewed by an Expert

THE GRASS beyond the fence does not look greener to the Westerner than his own particular plot of greensward. He likes his country and his climate and is not averse to telling the world about it. By the same token he is inclined to view his own problems a little more seriously than those of his Eastern brethren and to give a relatively disinterested shrug of the shoulders when someone mentions a matter that is of extreme importance to those residing east of the Rockies. The Western electrical man comes within the same category. He feels that his problems are singularly individual and is inclined to act accordingly. He knows that political bickering is playing merry Gehenna with development of the Colorado and Columbia Rivers but he seldom stops to think that the same may hold true of hydroelectric development in other sections of these broad United States.

The editors feel they are fortunate indeed to be able to present on another page of this issue a comprehensive review of some of the political aspects of hydroelectric development from a national viewpoint by a man well qualified to speak on this subject. Undoubtedly there will be many of our readers who will be surprised to note the apparent similarity between the undercurrent of political meddling in power development in New York and California. There is a familiar ring to the discussion of the situation in Alabama, in Tennessee and in New England that should be apparent at once to those who have followed closely the spreading of the political smoke screen that now enshrouds the Colorado River. The same holds true for the Northwest.

If the article does little else it will show that political propaganda with reference to water-power development is not confined to one section of the country alone. It also should show the necessity for the industry to present a solid front in rebuffing this political intolerance and meddling.

Claremont Substation

This 30,000-kva. Pacific Gas and Electric substation in the foothills back of Oakland, Calif., is one of the most important transmission feed points for the East Bay area, across the bay from San Francisco. At present the station is supplied from two 110-kv. lines that are looped through and feeds out over four 11-kv. lines. The station is one of the show places of the community.

Present-day Political Influence on Hydroelectric Development

By W. H. Onken, Jr.*
Editor, *Electrical World*, New York

IT IS estimated that fifty-five million horsepower is available in the streams and rivers of the United States; but for the accuracy of this figure no one can vouch. We know that there are abundant water powers in the Northwest and in the Southwest; that there are lesser amounts in the Rocky Mountain region and in the Central and Northern Appalachians; but whether the aggregate of all these water powers is thirty million or eighty million horsepower has yet to be determined.

Certain it is, however, that up to Jan. 1, 1927, approximately twelve million horsepower was developed, and of this amount more than 80 per cent was used by electric public utility companies. Not much, to be sure, but an increase of more than 50 per cent since 1921.

Viewed in the abstract, all will agree that it is better to utilize water powers now running to waste than to deplete our unreplenishable supplies of coal and oil. Why, then, are not more of our water powers harnessed? Why is not their energy converted into national prosperity and translated into social advantage?

If thirty million horsepower were to be generated by steam instead of water, the consumption of coal in modern stations operating on a 50 per cent load factor would be a hundred million tons per annum. At an average cost of $4 a ton at the boiler, the annual loss from burning coal and wasting water would be $400,000,000. Wherefore this profligacy? Why this miserly hoarding of resources, this tying up in a napkin of the talent bestowed upon us by Almighty God?

For a time, there existed in this country a zealous group of men who were so fearful lest coming generations might not have the wherewithal to warm, clothe and feed themselves, that they made it difficult and well-nigh impossible for any man or set of men to develop our national resources. They believed, mistakenly but none the less sincerely, that conservation means to keep all things as they are. As a result, hydroelectric development was seriously retarded.

THE author, who is probably better fitted to speak on this subject than any other individual, says: "Why with federal legislation permissive rather than restrictive, responsive and sympathetic with the principles of encouragement, should our water courses roar back a mocking echo to the call of industry? The answer is politics and intolerance. What is essentially an economic matter has been made a political issue, not only in Washington, but in California, in Alabama, in Tennessee, in New York, in the Northwest and in New England."

National Water Power Policy Established

For more than ten years Congress wrestled with the question of how best to conserve the vast water powers of the country and tried to enact legislation which would unshackle those on the public domain and in the navigable streams; but to no avail. Finally, in 1920, through the passage of the Federal Water Power Act, the United States definitely committed itself to a water power policy.

That measure, developed through many years of discussion and expriment, affects 85 per cent of all the water power available. In no other federal legislation has greater care been exercised in protecting essential public interests. Preference is given to power developments sought by states and municipalities, but such is the inertia of government, that only one state and only a few municipalities have applied for licenses.

On Jan. 1, 1927, the rated capacity of plants authorized and in operation under the Federal Water Power Act, was 1,500,000 hp. Licenses now issued cover the completion of a total installed capacity of 3,200,000 hp. in the next ten years.

Constructive and sympathetic as were the genius and statesmanship embodied in the Federal Water Power Act, and notwithstanding the very general approval it has won, there are movements now on foot to obtain special legislation for certain sites. These movements, if approved, would constitute a partial repeal of the act and would eventually result in its disintegration. They should be resolutely resisted. The Federal Water Power Act embodies in it the spirit of foresight. It is enabling, not disabling, legislation, indued with the sancity of reason, and it recognizes the economic place which water power development must occupy in the scheme of national aggrandisement.

The law possesses a twofold purpose. First, to put to beneficial use water which otherwise would run on forever to waste; and second, to produce from the falling water the power so vital to the nation's well-being and so essential to its industrial growth and supremacy. For it is axiomatic that the more extensively the soil is made to yield its bounty, the earth to give up its stored treasure, and the forest its accumulated wealth, the more urgent becomes the demand for power.

Economic and Social Aspects of Power

Cheap power is the first fundamental of industrial progress, just as cheap land is the first fundamental of agricultural growth. The social consequences which flow from it are tremendous. Recently, Lord Rothermere visited this country to investigate the reason for our vast industrial growth. Upon his return to England, he published an article in the *London Daily Mail*, and the following excerpts indicate the general tenor of his statements:

* Excerpts from an address before the Fifteenth Annual Meeting of the United States Chamber of Commerce, Washington, D. C., May 2-5, 1927.

The economic welfare of the United States is based more than anything else upon the fact that she has 29,000,000 horsepower of electricity established in her factories—a force that is estimated as the equivalent of 290,000,000 human workers. Each great center of population in the United States receives its power from a single producing organization which is generally linked in its turn with similar enterprises, in the same range of territory, for the elimination of wasteful duplication and the reduction of overhead charges. The result of having cheap power always at immediate call is that industrial production increases by leaps and bounds. The function of the American laborer is rapidly becoming limited to directing and controlling power, rather than supplying it from his own muscles. The great increase in the production of wealth thus brought about has very largely raised the workingman's wages and his standard of life. Very many of the American artisans one sees on their way to work with dungaree overalls and tin dinnerpails, earn twenty pounds a week all the year around, and own not only the houses they live in, but motor cars and expensive wireless sets besides. The explanation of their prosperity can be almost entirely compressed into two words—CHEAP POWER.

Considering the tremendous advantages, civic, economic, and social which follow the utilization of water power, why is not the rate of development more rapid? Why, with federal legislation permissive rather than restrictive, responsive and sympathetic with the principles of encouragement, should our water courses roar back a mocking echo to the call of industry? The answer is politics and intolerance. What is essentially an economic matter has been made a political issue, not only in Washington, but in California, in Alabama, in Tennessee, in New York, in the Northwest, and in New England.

Men of vision, daring and skill, who are willing to abide by the law and contribute to our national prosperity, are hampered and stopped by the petty entanglements of bureaucracy, legal uncertainties, socialistic and paternalistic escheats and utopian nostrums.

Socialistic Aspirations of New York

In New York, there is more than three million continuous horsepower unused and available for development on the Niagara, St. Lawrence, and interior streams. This does not represent the total hydroelectric possibilities but only projects carefully studied and which can be economically converted into power. The Empire State needs this electrical energy and the saving in fuel made possible thereby because she possesses the water while she must import the coal. Moreover, in the development of any or all of this water power, no rights or interests of the state are surrendered or given away. They are all fully protected by existing laws. Advocates of state development of water power contend that these unused powers are so large and important to the public that no private interests should be permitted to handle them. They seek the repeal of the State Water Power Act of 1921 and would substitute an indirect form of state development through the agency of a Water Power authority—a creature of the state yet lacking state credit. While the proposed legislation has not been enacted into law, it has been quite effective in discouraging hydroelectric development in New York and has given aid and comfort to similar socialistic and paternalistic measures elsewhere.

Those who are endeavoring to have this doctrine prevail in the belief that they are rendering a great public service will sooner or later awake to the realization that the men of ability, experience and character who have developed the public service industries of the country, have made new discoveries and inventions in the arts involved, devised new methods of operation and through combinations of properties and management have reduced the cost of the service to the benefit of the public, will either be driven out of the field of such industrial activities by such measures or will voluntarily abandon it, allowing it to pass into the hands of mediocre men.

The Muscle Shoals Controversy

Consider Muscle Shoals. Who has not heard of that wartime development on the Tennessee River in Alabama? Volumes have been written on it and for five years Congress has been debating over its final disposition without coming to any conclusion. The development and distribution of power is so essential to the South's progress that those engaged in the industry feel impelled to point out the importance of devoting the six million horsepower remaining undeveloped in that section to public as opposed to private use. For the most part, water power developments in the Southeast have been made by public utility companies. The power is thus impressed with a public use and is distributed by the electric service companies to operate machinery and light the streets, stores and homes.

I will not take time to discuss the merits of the present controversy over Muscle Shoals. I can only say with Disraeli, "The world is wearied of statesmen whom democracy has degraded into politicians."

Tennessee Must Wait on Congressional Action

But who in Tennessee ever dreamed that because the United States decided to develop a power site in Muscle Shoals, Alabama, the sovereign state of Tennessee would have to mark time while Congressmen in Washington spend year after year in interminable debate on what ought to be done with Muscle Shoals?

Nevertheless, two Tennessee public utility companies which, with an eye to the future and in response to increasing demand for power, made a joint application for permits on eleven sites on the Upper Tennessee and Clinch Rivers, have been waiting almost four years for the privilege of investing between $60,000,000 and $100,000,000 in power projects of benefit to the people and industries of Tennessee.

If the privilege be too long deferred, these public utility companies will be faced with the necessity of importing power from outside the state. Then Tennessee will be in the strange position of a state possessing abundant opportunity for water power development within her own borders but erecting expensive fuel-burning power stations or seeking electrical energy elsewhere, and in the latter case she will forego the economic benefits and taxable values accruing from hydroelectric development.

It is of interest to observe in this connection that many of the states do not look favorably upon the export of power generated from their streams. Maine, for example, prohibits the export of hydroelectric energy, while the West Virginia Legislature has just passed a bill to the same effect which is awaiting executive action. Similar provisions will be found in the statutes of New Hampshire and Wisconsin but their constitutionality is not free from doubt.

Government Anxious to Engage in Power Business

In the proposed development at Boulder Canyon on the Colorado River at the Arizona-Nevada border, a daring innovation is involved. The government seeks to erect a high dam for flood control and irrigation purposes and expects to recoup the cost of the development by the generation and sale of electricity. Not only is circumvention of the Federal Water Power Act sought through this special legislation, but the government also is attempting to engage in the power business.

Here we have a matter of most vital present concern to every citizen as well as to the future of our country. The plan is absolutely contrary to American ideals and subversive of American institutions. Flood control is a governmental function; the sale of electric power is not, but is a proprietary function in which no democratic government should engage because to do so would encroach on the rights and privileges of its citizens. Moreover the Boulder Canyon project affects the autonomy of the state, for how can the state tax property or regulate

the rates and service of a plant owned and operated by the national government?

That the established tradition and sound policy of the United States with respect to the disposition of its unappropriated public lands is opposed to deriving revenue therefrom, was the consensus of opinion in the Conservation Congress held in Washington in 1913. If, then, the United States ought not to adopt the policy of making revenue out of what it owns—that is, the land—how much less is it entitled to profit from what it does not own—namely, the water, and the power to control its appropriation and use for beneficial purposes.

It may be conceded that when the federal government in order to improve navigation, builds dams and locks on any of our navigable streams and thereby creates incidental water power, it may use, lease or sell that power to the best advantage, just as it might lease or sell a building which it had erected for some authorized federal use but no longer required. It would hardly be contended, however, that the federal government could go into the business of erecting office buildings for rent, or that it should build dams and power houses solely for the purpose of selling power in unfair competition with its own citizens. Such things are not contemplated or authorized by the Constitution, and yet there is a growing disposition on the part of government bureaus to engage in just such practices.

The point I wish to stress is, that our national water power policy is embodied in the Federal Water Power Act, and while this provides for recapture after fifty years and is favorable to government and all subdivisions of government, it does not shut the door to private initiative and enterprise. That the policy enunciated in 1920 is rational and enlightened is proved by the millions of horsepower which have been developed under its provisions. It is one of the most outstanding and constructive pieces of legislation enacted by any Congress, and every effort should be made to safeguard it.

All Water Power Development Not Economical

There is no industry more deserving of encouragement than that devoted to hydroelectric development, but—and I cannot emphasize this too strongly—all water power is not susceptible to economic development nor is there sufficient water power for all industrial purposes, nor does water power necessarily mean cheap power. "All that glitters is not gold," and there is many a waterfall, like many a woman, possessing naught but the fatal gift of beauty. Nor can it be assumed that water power will, nor can entirely, displace steam power.

Millions of horsepower of undeveloped energy in Oregon and Washington are, because of the present state of the art of electric transmission, of no use to New York or Pennsylvania. Even electricity from the waters of northern New York cannot be developed and transmitted under present conditions to compete with steam power at tide water in New York City. Out in California, transmitted hydroelectric energy generated in the high Sierra is no longer as cheap as steam-generated energy in Los Angeles, owing to the improved economy of modern super-power steam stations.

Steam Versus Water Power

There are very definite limits to the ability of water power to compete with steam power in the present state of the art, notwithstanding that our huge water power systems have almost reached the acme of perfection so far as efficiency is concerned, and super-power steam stations have not yet approached that point. For that reason, steam stations are increasing in size and output at a greater rate than hydroelectric stations, and unless many water power sites are developed at once, they may not be developed for many years to come.

Yet, there is a persistent popular notion that any waterfall can be converted hydroelectrically into a never-ending stream of gold. The actual cost of electricity at the power house is only a small item in the total cost of the service. In a hydroelectric station the average cost of electricity may be very small indeed—the cost of transmission, distribution and service being many times the cost of the electricity itself. In fact, if the electricity were to be delivered at the switchboard free, the reduction in cost thus made possible to the ultimate consumer would be almost negligible. The same general proportion is true for steam generated electricity with the exception that steam stations in large centers rarely require transmission networks.

A steam station can be erected at any place where fuel can be readily secured and where large quantities of water are available for condensing purposes. In the case of water power, however, the energy must be developed where nature provides the water, and if the location is too far from possible markets, it may be cheaper to erect a steam power station. In such a case, that particular water power site will remain unharnessed until its power can be used economically as part of a power reservoir in a large interconnected system.

The Modern System of Power Production

The remarkable economies made in the power costs of fuel-burning stations have brought about such savings that some water powers can no longer be developed on a competitive basis and the dollar differentials in favor of fuel power increase yearly both on account of new economies in fuel-burning stations and because labor, material, and land values in water power developments continue to rise in price.

Steam station production costs at a water power site are competitive with water power costs in many instances and if, as is usually the case, the costs created by transmission lines are added to the water power costs, the total water power costs measured at energy delivery points are greater as a rule than those involved in building and operating steam stations at the points where the loads exist.

I would not have you conclude from the foregoing that there is little hope for future hydroelectric developments. The opportunities, on the contrary, are as great as ever, but the development of large steam and water power plants and the improvements made in the transmission of power have raised new problems as to the most economical methods of operation.

New power projects must hereafter be considered and studied in combination with existing power plants. The ultimate development of our water powers involves interconnection of existing stations if maximum use is to be made of them and the developments are to be profitable. Both for the conservation of the fuel supply and the economic advantages resulting from the use of power in our industries, development of all possible water powers and their interconnection with the existing systems should be encouraged.

The situation virtually dictates the development of water powers by existing public utility companies. By and large, the electrical industry is ready to act if permitted. It can produce a systematic, comprehensive development of the nation's unused water powers in a way to ultilize their fullest value, and it can through its knowledge, experience and skill, create markets in most instances which will absorb the huge volume of power produced.

Recent Developments in Japanese Hydroelectric Progress

By I. F. Baker
Managing Director, Westinghouse Electric Company of Japan

MARKED progress has been made in Japan during the past five years in hydroelectric development. In this article the author discusses the systems and plans of two af the newest of the Japanese electric companies, the Nippon Hydroelectric Company and the Tokyo Hydroelectric Company. Both companies operate extensive systems and the latter is planning a 220-kv. transmission network.

FOR THE past five years engineers have watched with interest the rapid growth of Japanese hydroelectric power companies of which the best known have been the Daido, Toho, Tokyo and Ujigawa electric companies. These firmly established enterprises have been in existence for several years and during the past five years have expanded rapidly to a point where they now have a combined installed capacity of 1,200,000 kw. and a capitalization in excess of $500,000,000. More recently attention has been directed to the rapid progress being made by two newer organizations, the Nippon Hydroelectric Company and the Tokyo Hydroelectric Company, both of which are engaged actively in new development work.

Nippon Denryoku

The Nippon Denryoku was planned originally in 1910 by interests that had promoted successfully the Ujigawa Electric Company. It was not established, however, until 1919 when it was organized to develop three projects. The initial project called for the develpoment of about 60,000 kw. at Seto on the Hida River in Gifu Prefecture, and at other power stations along the same stream. The second project was under the control of the Toyo Aluminum Company which secured licenses for the development of 200,000 kw. along the Jinsu and Kurobe Rivers in Toyama Prefecture. The third development, the 10,000-kw. Kametani plant of the Etchu Electric Power Company, is located on the Joganji River in Toyama Prefecture. Recently all three of these companies have been brought together under the Nippon Denryoku. A 200-mile, 154-kv. transmission line has been constructed tying all of the plants into one system terminating at Osaka where a 100,000-kw. steam plant has been built.

The Hida River system at present consists of the Seto station where four 7,500-kva., 3-phase, 60-cycle, 1,100-volt Westinghouse vertical generators are driven by Escher Wyss water wheels operating with 1,500 sec-ft. of water under a head of 335 ft. A 154-kv. outdoor switching station was constructed in conjunction with the plant. A second generating station with a capacity of 14,000 kw. is to be erected on the same stream at Kosaka; a third with a capacity of 7,000 kw will be built at Kukono; and a fourth plant with a capacity of 10,000 kw. will be installed on the tributary, Masegawa.

Construction of the Hida River project entails many difficulties as the present railhead is 50 miles from the Seto station. Much of the material is transported over a 21-mile ropeway.

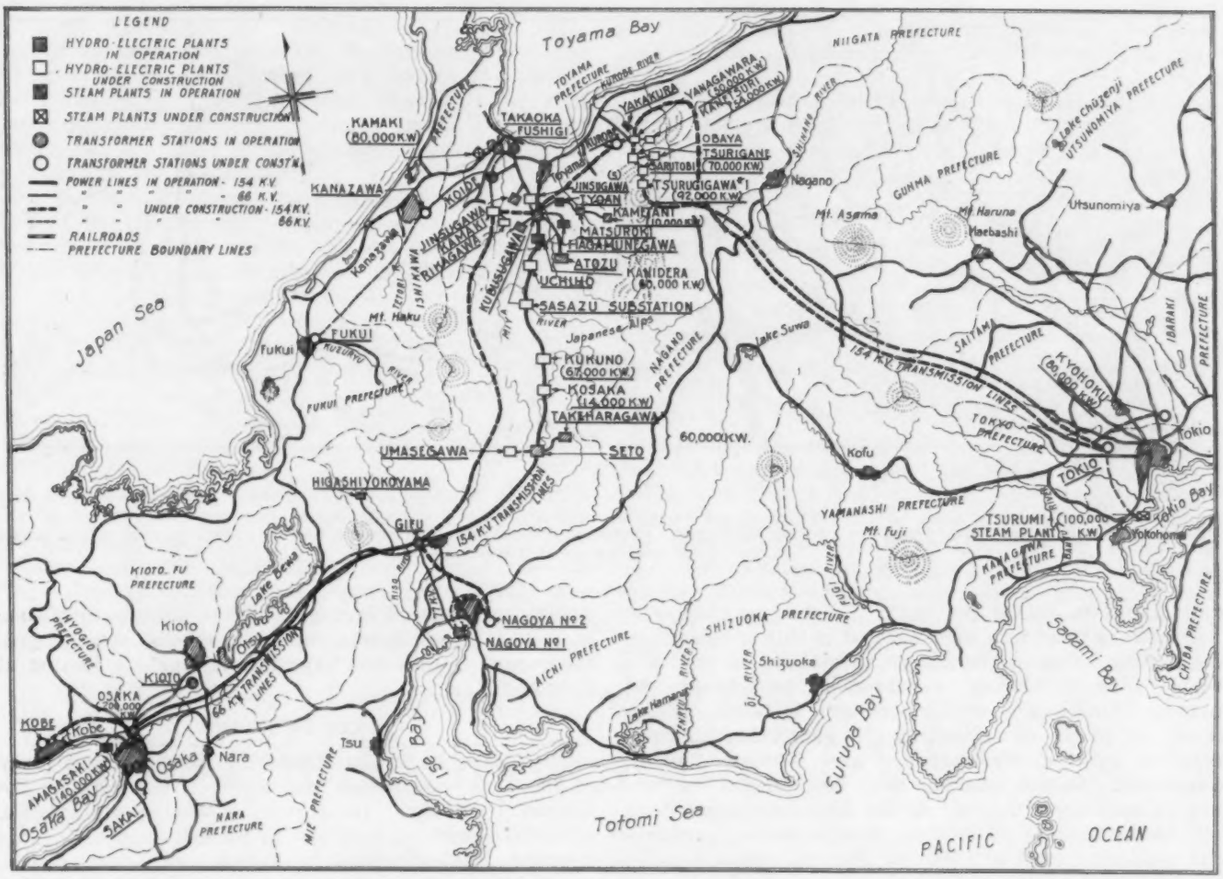
A second important element in the system is the Miya River development. Already there is a 60,000-kva. plant constructed on this stream at Kanidera. The generating equipment consists of two 30,000-kva. General Electric generators driven by Escher Wyss turbines operating under a head of 444 ft. At Utsubo, where the intake for the Kanidera plant is located, there is to be constructed another station with a capacity of 26,000 kw. A third plant is contemplated at Omigari where 5,200 kw. will be installed.

Construction is under way at the present time on the first station of a series of plants on the Kurobe River in the Japanese Alps. Located almost midway between Osaka and Tokyo, the two important load centers of the system, the Kurobe plants will be equipped with double-frequency generating equipment so that power may be furnished to either district. (Tokyo uses energy at 50 cycles; Osaka at 60 cycles.) The first station will be known as the Yanagiwara plant and will be equipped with three 20,000-kva. vertical Westinghouse generators delivering 50-cycle current at 300 r.p.m. and 60-cycle current at 360 r.p.m. Voltage is kept approximately constant at both frequencies by using the windings connected star at 50 cycles and interconnected star at 60 cycles. By suitable design of the generators the change of connection can be made readily by means of disconnecting switches. In order to secure higher hydraulic efficiency two sets of turbine runners are supplied for the Escher Wyss turbines, one for 300 r.p.m. and one for 360 r.p.m. The head at this station is 408 ft. The generators are designed so that any one will charge the 200-mile, 154-kv. transmission line with perfect stability. Water is supplied to the plant through a 7½-mile tunnel.

The accompanying map of the Kurobe River project shows not only the Yanagiwara plant, but also the future developments at Kanetsuri (54,000 kw.), Sarutobi (70,000 kw), Tsurugigawa No. 1 (92,000 kw.) and nine other smaller stations totaling 65,000 kw. The total development, therefore, will furnish, when completed, approximately 300,000 kw. It is planned to supply storage for the entire chain of plants by the construction of a high dam above the Tsurugigawa plant.

Still another important link in the chain of hydroelectric stations of the Nippon company is the Komaki plant on the Sho River. At this point there is being constructed a 1,000-ft. dam 260 ft. high. Storage to the extent of about 30,000 acre-ft. will be provided for the four 20,000-kva. double-frequency generators. The plant will be used extensively for standby and peaking because of its relatively large storage.

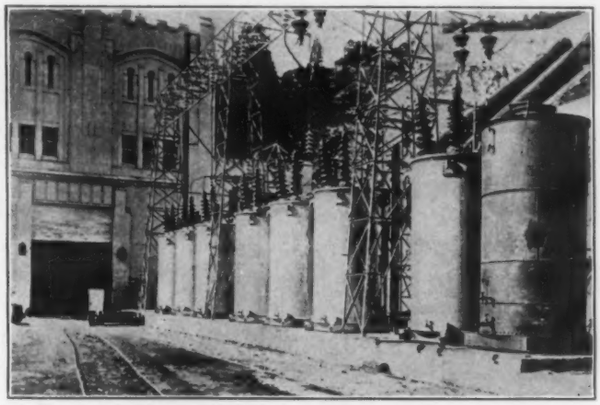
As a balance against the hydro capacity of the system the company is adding two 25,000-kw. and one 40,000-kw. turbo-generators to the Amagasaki steam plant lo-



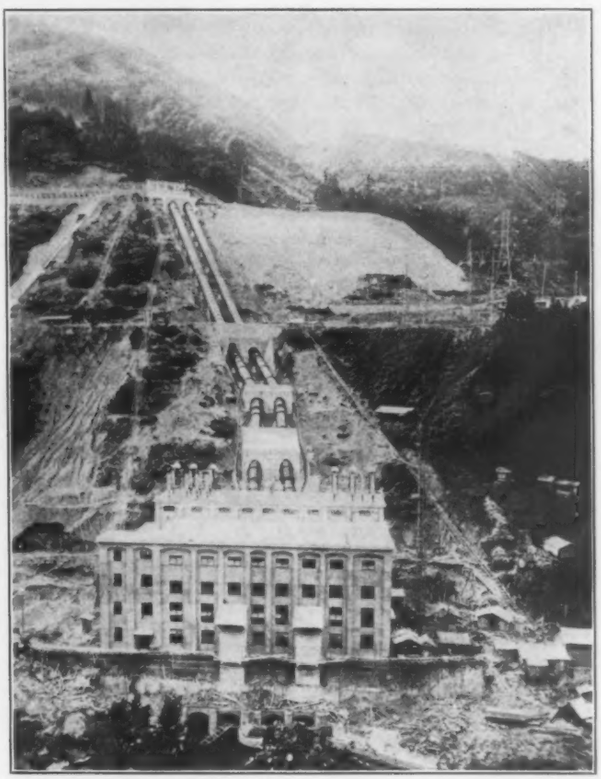
Map of the extensive system of the Nippon Denryoku which provides energy for the important cities of Tokyo, Kobe, Osaka and Nagoya. (Translation on this and other maps courtesy of I. Kobayashi, University of California.)

cated about midway between Kobe and Osaka. On both sides of the plant are rivers convenient for the transportation of coal and supply of condensing water. Plans have been drawn up for a second large steam plant with a capacity of 100,000 kw. to be located on Tokyo Bay between Tokyo and Yokahama. This will supplement the hydroelectric power supplied to these two cities over the transmission lines from the plants in the Toyama district.

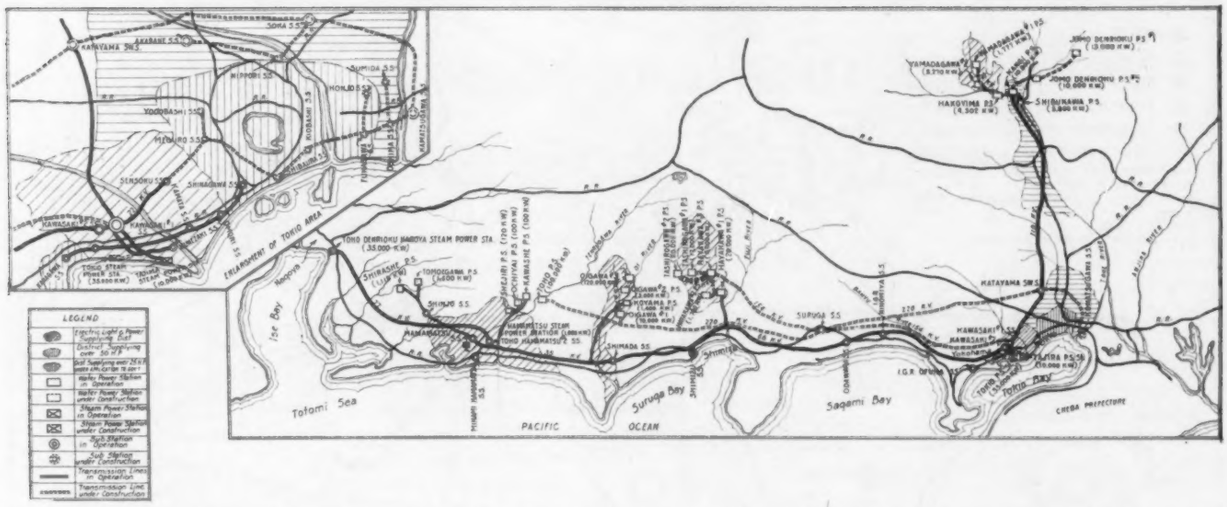
One of the most important substations on the system is at Sasazu midway between Osaka and Tokyo. Here energy is collected from the generating stations in the Toyama district for transmission by way of the Seto



Seven 5,000-kva. transformers at the Momoyama station of the Diado Electric Power Company. The use of large numbers of low-capacity transformers seems to be typical of Japanese installations.



Kanidera station of the Nippon Electric Power Company with two 30,000-kva. units installed.



Map of the system of the Toyko Denryoku showing the location of the proposed 220-kv. transmission line connecting a series of new plants with the load center at Tokyo.

and Kanidera plants to Osaka. Later on, the new Yanigawara plant may be connected to this same switching station. One of the largest substations is at Osaka where four 25,000-kva. synchronous condensers and twenty 10,000-kva. transformers are installed. Practically all of the equipment at this substation has been supplied by the Westinghouse and General Electric companies. Orders recently have been placed for two new substations at Tokyo. At the Keihoku station there will be installed a 30,000-kva. Westinghouse synchronous condenser with a 2,500-hp. starting motor capable of driving the condenser while charging the line at 22,500 kva., current lagging. At the Keinan substation at Tokyo there will be a second 30,000-kva. synchronous condenser. Additional large substations are located at Gifu and Nagoya.

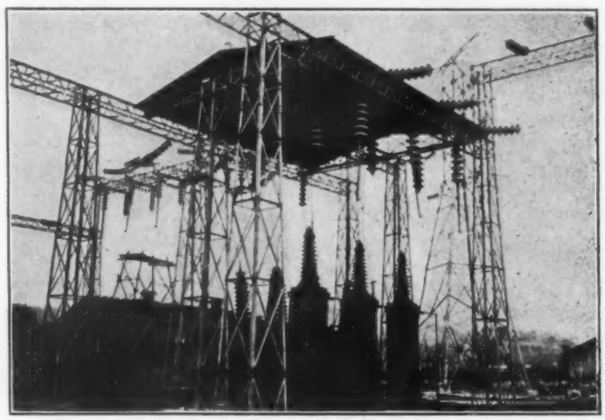
Kurobe River project of the Nippon Denryoku where 300,000 kw. is being developed.

Tokyo Denryoku

The Tokyo Denryoku Kabushiki Kaisha enjoys many of the same advantages mentioned in the case of the Nippon Denryoku. It is rich in water-power rights, potential power markets and in financial support. This company was organized in March, 1925, through the consolidation of the Hayakawa Denryoku K. K., which had large water-power rights west of Tokyo and valuable franchises for the sale of power, and the Gumma Denryoku K. K., which was established in July, 1919, using water power from the north of Tokyo and supplying current to the district between Tokyo and Yokohama.

Each company contributed approximately 25,000 kw. of plant capacity at the time of the amalgamation, but since that time extensions have been rapid. A 70,000-kw. steam plant is being erected at Tsurumi between Tokyo and Yokohama and two large substations are being built near by to handle power from hydro developments.

Four large river systems can be utilized by this company. The Tashiro River affords a total head of 3,000



Outdoor switching station at Kawasaki. Note the shelter over the oil circuit breakers and current transformers.

ft., from which 200,000 kw. may be realized. Machinery has been purchased for the construction of the Tashirogawa No. 1 plant which will contain two 13,000-kva. horizontal generators, 3-phase, 60-cycle, 11-kv. connected to impulse wheels operating under a head of 1,152½ ft. A similar 20,000 kva. unit is being built for Tashirogawa No. 2 station.

About 100,000 kw. will be obtained from the upper part of the Ohi River which belongs to the sister company, the Toho Denryoku, and this power will eventually be carried to Tokyo together with another 100,000 kw. which can be purchased from the same company. A new high-tension transmission line suitable for a voltage of 220 kv. with ungrounded neutral is being considered.

The Azuma River has been partially developed by the installation of two generating stations, 7,000 kva. at Shibukawa and 12,750 kva. at Kanai. However, there is available much more power on the upper part of the river.

It is expected that 500,000 kw. of generated and purchased power will be sold eventually in Tokyo by the Tokyo Denryoku K. K.

When the Gumma Denryoku decided to bring power to Tokyo voltage at the two generating stations was stepped up from 6.6 to 115 kv. Six 3,500-kva. transformers were installed at Kanai generating station and an equal number of step-down transformers are being used 85 miles distant at the Kawasaki substation near Tokyo.

For the recent greater power development of the Tokyo Denryoku, Westinghouse 154-kv. shell-type transformers again are being used. There will be 20 of these units all of exceptional capacity located at the following stations:

Komatsugawa substation, Tokyo.—Six oil-insulated, water-cooled, shell-type, 3-winding transformers 15,000 kva., 154-kv. primary; 18,000 kva., 66-kv. secondary; 10,000 kva., 11-kv. tertiary. It may be noted that the vector sum of the capacities of tertiary and secondary windings is equal to the primary capacity.

Hayakawa No. 3 substation.—Seven 16,000 kva., 2-winding transformers raising the voltage from 22 or 11 kv. to 154 kv. The high-tension windings are connected star, giving line potentials of 168, 161 or 154 kv.

Kawasaki substation.—Seven 15,000 kva., 3-winding transformers star-connected with taps for line potentials of 133, 140 and 147 kv. The secondary has a capacity of 15,000 kva. at 22 or 11 kv., while the tertiary delivers 10,000 kva. at 11 kv.

The majority of the developments of the Toyko Denryoku were completed by the end of 1926.

There is urgent need for the power now being developed by these companies as in some sections of Japan the demand for electric light is increasing 16 per cent and electric power 50 per cent per year. The time is not far distant when present power schemes will be realized in full and new and greater projects must be executed.

Electric Dehydration of Walnuts

By Arthur W. Christie

Assistant Professor of Fruit Products, University of California

THE WALNUT is one of the important horticultural crops of California. Nearly 5,000 growers are engaged in growing this king of nuts on an aggregate area of some 110,000 acres. The present normal production is over 50,000,000 pounds annually, with a farm value in excess of $10,000,000. Rapid increase in bearing acreage is gradually swelling the production. Oregon, the only other state producing walnuts, is also increasing its production, but the Oregon crop is only a small percentage of the California crop.

Reasons for Drying

When walnuts mature from September to November, the green hulls encasing the nuts nomally split open and the nuts drop or are shaken to the ground. The nuts are then gathered into sacks and the hulls removed by hand or by special hulling machines. The harvested nuts are termed "green" because they contain considerable excess moisture, which must be removed before the walnuts can be marketed. Prompt and thorough evaporation of this moisture is essential in order that: first, the walnuts will have a stable weight when sold; second, possible deterioration of the kernels through darkening or mold will be prevented, and third, dryness of the shells will permit efficient bleaching.

Natural Drying

Until recent years, the drying of walnuts has been almost entirely by natural means, the hulled nuts being exposed in slat bottom trays to the drying action of the sun and wind. While advantageous in its employment of simple, inexpensive equipment, this method is not continuous and is slow and uncertain because of its dependence on uncontrollable weather conditions which, in seasons of early fall rains, make natural drying difficult.

The slowness and uncertainty of natural drying occasioned a growing interest in the advantages of rapid drying by artificial means. Recent years have seen a rapid increase in the construction and use of dehydraters for walnuts. During the 1926 season, 145 walnut dehydraters were operated in California and 35 per cent of the state crop was dried by this modern method. Many of the oldest and most experienced growers are now using dehydraters and their success therewith presages the ultimate use of this modern method on nearly all walnuts.

Advantages of Dehydration

The comparative advantages of dehydration over the natural drying of walnuts, as set forth by the writer in Bulletin 376 of the University of California, Agricultural Experiment Station, may be briefly described as follows:

Drying Efficiency.—A dehydrater gives rapid, thorough and uniform drying of walnuts, independent of weather conditions. Over-drying or under-drying, darkening or molding of kernels and splitting of shells, all of which occur more or less in natural drying, can be avoided by dehydration.

Theft Protection.—Occasional thefts of valuable walnuts, when exposed out of doors in open trays, are avoided by the use of a dehydrater, which serves as a safe deposit for the nuts during drying.

Marketing Efficiency.—While not physically perishable, walnuts are classed as "financially perishable," because the principal demand comes during the holiday season from Hallowe'en to Christmas. Unless most of the crop reaches distant markets in ample time for this seasonal demand, its sale at profitable prices is very difficult. Dehydraters, drying the nuts in 24 hours regardless of weather conditions, furnish a steady supply

of cured nuts to the packing houses, which in turn are able to ship the nuts to market weeks sooner than if dependent on naturally dried nuts.

OPERATING EFFICIENCY.—The total cost for labor, heat and power to operate a walnut dehydrater is approximately half that of the labor cost required in traying, stirring, stacking, covering and otherwise handling the nuts during the protracted natural drying.

While the overhead costs on the greater investment in a dehydrater make the total cost of dehydration as great as or slightly greater than for normal sun drying, the above mentioned advantages swing the balance decidedly in favor of dehydration, which accounts for its rapid adoption.

THE BIN-TYPE DEHYDRATER

Several types of dehydraters have been developed particularly for walnuts but the great majority of those installed in recent years have been built by the Edward B. Ward Company of San Francisco and Los Angeles, Calif. This bin-type accomplishes rapid drying of the nuts, which are held in round or square bins usually of one ton capacity, by forcing a strong blast of heated air through the spaces between the nuts. The air is warmed to 110 deg. F. by passing through a heating chamber, and is then forced through the bins of nuts by a multivane fan operated by an electric motor. The air serves the double purpose of conveying to the nuts the heat necessary to evaporate their excess moisture and of then absorbing and carrying away the resultant vapor.

The writer has for several years conducted an extensive investigation of the basic principles of construction and operation for walnut dehydraters. During 1925, this work was in collaboration with T. A. Wood, field engineer for the California Committee on the Relation of Electricity to Agriculture, the data gathered being available in Progress Report No. 6 of that committee.

The following brief summary is based on careful measurements made during the normal operation of 25 standard types of dehydraters in 1924 and 1925.

The amount of moisture which must be evaporated from walnuts varies greatly, decreasing as the harvest season advances. The "green" nuts were found to contain from 15 to 35 per cent moisture, averaging 25 per cent. The dried nuts contained an average of 8 per cent moisture. From these figures it is seen that 18.4 per cent of the green weight of the nuts is lost during drying, or, in other words, the production of one ton of dried nuts necessitates an average evaporation of 453 pounds of water. It usually is assumed that the amount of heat theoretically required to warm the nuts to 110 deg. F., the temperature of dehydration, and then evaporate water therefrom, is approximately 1,100 B.t.u. per pound of water evaporated. This means that the amount of heat theoretically required to produce one ton of dried nuts is, in round numbers, 500,000 B.t.u. In addition to the heat required to evaporate the moisture, heat must be supplied to compensate for several other more or less unavoidable losses, such as

1. Loss of heat by radiation from the heating chamber, flues, bins, etc.
2. Loss of heat with the air discharged for moisture removal.
3. Loss of heat by withdrawal of the warm dried nuts.
4. Loss of heat through the stacks of indirect heating systems.

Tests made on 12 dehydraters, in which the air was heated indirectly by an oil burning furnace, gave an average overall fuel efficiency of only 19 per cent. Tests on 10 other plants burning natural gas gave a fuel efficiency of 23 per cent. Tests made on two electrically heated dehydraters on two different years gave fuel efficiencies ranging from 32 to 59 per cent, averaging 44 per cent.

The greater efficiency of electric heating is due primarily to the elimination of stack losses and to some extent to lower radiation losses from the heating chamber, which losses account for the lower fuel efficiency of dehydraters obtaining heat from oil or gas fired furnaces.

Assuming a gallon of oil to yield 142,000 B.t.u., and a kw-hr. of electricity 3,400 B.t.u., it can be seen that with the above average efficiencies the evaporation of moisture in the production of a ton of dried walnuts requires 18.5 gal. of oil or 334 kw-hr.

Since the average of many tests shows a loss of 0.85 per cent of the green weight of the nuts per hour or a total drying time of 22 hours, the hourly consumption will be approximately 0.84 gal. of oil or 15 kw-hr. Taking the average costs of 6 cents per gal. of oil and 1 cent per kw-hr. of electricity being paid by the owners of these plants, it is found that the average costs for heat are $1.11 for oil and $3.34 for electricity per ton of dried nuts, or $2.23 higher for electric heat.

However, this difference is partly reduced by the fact that oil burning dehydraters are charged 2 cents or more per kw-hr. for the power used for operation of fans and burners because of the much smaller amount used. Since the average power consumption is 24 kw-hr. per dried ton, this makes the total cost for power and heat only $2 more for electrically-heated dehydraters. This represents only 1/10 of a cent more per dried pound or only 1/250 part of the value of the walnuts.

ADVANTAGES OF ELECTRIC HEAT

Despite the greater cost of electric heat for walnut dehyraters, this method of heating possesses certain definite advantages which, although difficult of financial evaluation, are felt by the owners of electric dehydraters and other growers contemplating the installation of dehydraters to offset largely the greater cost of operation. Some of the more important advantages are:

1. Simplicity, cleanliness and automatic control of heating system.
2. Reduced fire hazard.
3. Reduced depreciation and upkeep costs.

Although the total cost of installation of electrically-heated dehydraters has so far been little, if any, less than for oil burning plants, growers who already have a sufficient electric load on their place for irrigation pumps or other purposes which are not in use during the drying season, prefer to utilize this load for heating their dehydrater, through the medium of a double throw switch, rather than install oil tanks and burners for which they may have no other use. Since the cost per unit of electricity is usually proportional to the total amount consumed, this double use of the connected load often gives a lower average rate per kw-hr.

A MODERN ELECTRIC DEHYDRATER

While most of the dehydraters so far installed have been oil heated and a number located in the neighborhood of oil fields are utilizing cheap natural gas, at least four walnut dehydraters have been equipped with electric heaters. Of the latter, the dehydrater recently installed by the E. B. Ward Company, on the G. M. Gest walnut grove near Mountain View in Santa Clara County, Calif., may be said to be the "last word" in electric walnut dehydraters.

Mr. Gest, a contracting engineer, is best known for his installation of underground conduit systems in many

cities of North America. The production of fine quality walnuts on his California ranch is a hobby with him. Only the most modern methods of production are employed and the carefully graded and highly developed types of walnuts are packed in small fibre cases and sold direct to consumers. An adequate up-to-date packing house equipped with the latest processing machinery affords prompt and efficient preparation of the walnuts for market.

The most outstanding piece of equipment is the one-ton, electrically-heated, Ward walnut dehydrater. The drying chamber consists of an upright cylindrical bin with a volume of 100 cu.ft., which at 20 lb. of dried walnuts per cu.ft., gives a capacity of one ton of dried walnuts per charge. The "green" walnuts brought from the field are first passed through a power driven huller and washer and then elevated to a wooden bin above the dehydrater. The nuts then flow by gravity into the dehydrater bin, which when full, is closed, and heated air is forced vertically through the mass of nuts until they are sufficiently dry, as judged by samples withdrawn periodically. A gate, just above the heavy screen floor of the bin, is then opened and the dried nuts run out by gravity on to a conveyor which deposits them in temporary storage bins awaiting bleaching, grading and packing.

The air flow is supplied by a No. 3 Sturtevant multivane fan operated at 940 r.p.m. by a 1½-hp., 220-volt, General Electric motor. At this speed the fan delivers approximately 3,000 cu.ft. of air per min. against a static pressure of 1½ in. The air enters the bin at 110 deg. F., and air passing through the nuts drops to a temperature of 90 to 100 deg., while at the same time its humidity increases by absorption of the moisture evaporated from the nuts. Most of this air is recirculated through the heating chamber and fan in order to conserve the added heat it still retains. By proper adjustment of air discharge and intake dampers, a sufficient amount of air is constantly discharged and replaced by an equivalent amount of fresh air so that the resultant mixture after re-heating to 110 deg. will not exceed the allowable humidity, usually 20 per cent. In order that all the nuts will dry at the same rate the direction of air flow through the bin is periodically reversed by a damper so that half the time the air flow is upward and the other half of the time downward. By this simple method all nuts are dried at the same average temperature and humidity.

The air is heated by a battery of six General Electric 110-volt, 2.5-kw. industrial oven heaters, so disposed in a sheet metal flue adjacent to the fan intake, that all the air is brought into intimate contact with the heaters These heaters are connected in series to a 440-volt circuit in such a way as to give a total load of 20 kw. The current is brought to the packing house through underground conduit from roadside transformers nearly 1,000 ft. away. A General Electric bimetallic thermostat, actuating a relay-operated magnetic switch, controls the air temperature to 110 deg. By means of a double throw switch, Mr. Gest also uses the same line for a 75-hp. irrigation pump motor to feed an irrigating system covering the entire 55 acres of land.

This model installation shows what can be accomplished in the use of electric heat for walnut dehydration and will doubtless stimulate the installation of other similar plants. A new field is therefore opened to power producing companies as well as electrical machinery manufacturers. Installations of this kind inspire interest in the electrical dehydrating of fruit in general.

Tentative Standards for Rating Power Resources of Rivers Adopted

AS a result of the confusion which arose at the World Power Conference in London in 1924 over the various ratings used in different countries to state the power resources of rivers, the American Engineering Standards Committee, in October, 1924, appointed a sectional committee to formulate rules for stating the potential power resources of rivers and the capacities of water power plants in the United States. N. C. Grover, chief hydraulic engineer, U. S. Geological Survey, Washington, D. C., was appointed chairman of this committee and forty engineers, representing the consulting engineering, financing and management groups, the manufacturers, state and municipal organizations, and the federal government, were appointed as members. The committee, after a number of meetings has formulated a tentative set of rules based on the following conclusions:

(a) The duration curve based upon records of daily discharge of at least five years, and preferably longer, should be used in the determination of the rates of flow that are made a part of the rules.

(b) One hundred per cent efficiency at gross head of the site should be used, leaving to the judgment of the user of the data the determination of the proper efficiency factor or factors applicable to any situation.

(c) Energy should be expressed preferably in kilowatts with the horsepower equivalent in parentheses.

The rules have been adopted tentatively with the idea that they be broadly circulated in order to obtain a general discussion before final adoption. The committee points out that they are not intended as bases for design or operation or to take the place of detailed and complicated investigations or studies necessary to determine the feasibility of a site or the best manner of development. The rules are:

Undeveloped Site or Stretch of River—The rating of undeveloped sites will show gross energy based on 100 per cent efficiency and gross head, and will be expressed in kilowatts with the horsepower equivalent in parentheses, except in instances where it is desirable to make comparisons on the horsepower basis when the gross horsepower will be given and the equivalent kilowatts in parentheses. In this rule gross head is the difference in elevation of water at the point of diversion or pool created by the dam and the return of water to the stream; or if a stretch of river be considered on which surveys are not available to determine the probable method of development, the total gross head which it is believed may be developed.

The rating will be shown for the following conditions:

(1) Power based on natural flow available 90 per cent of the time. The 90-per-cent-time-flow is the flow occurring at the site 90 per cent of the time as determined in general by a study of the records of mean daily discharge. In instances where the records are fragmentary or of short duration, however, estimate of the 90-per-cent-time-flow will be based on all available data and applied over a sufficient length of time to render improbable that additional records will materially change it. Mean weekly or mean monthly flows may give reasonable accuracy but will in general show exaggerated flow.

Theoretical kilowatt $= H \times Q_{90} \times .08$.

Theoretical horsepower $= H \times Q_{90} \times .11$.

Where H = gross head in feet corresponding to 90-per-cent-time-flow.

Q_{90} = 90-per-cent-time-flow in second-feet.

.08 and .11 = factors to give approximately 100 per cent efficiency.

(2) Power based on natural flow available 50 per cent of the time; the 50-per-cent-time-flow being the flow occurring at the site for half the time based upon a study of the record of mean daily discharge or so estimated that it would not be materially changed were a study to be based on long-time records of daily discharge.

Theoretical kilowatts $= H \times Q_{50} \times .08$.

Theoretical horsepower $= H \times Q_{50} \times .11$.

Where H = gross head in feet corresponding to 50-per-cent-time-flow.

Q_{50} = 50-per-cent-time-flow in second-feet.

.08 and .11 = factors to give approximately 100 per cent efficiency.

(3) Capacity of reservoir sites, above the lowest level of drawdown, expressed either in acre-feet or cubic feet, that is reasonably probable of utilization, directly or indirectly, for increasing the power resources, together with an estimate of the resulting increase in power resource stated in such terms that a comparison may be made with the power resource obtained by rules 1 and 2 of the site or stretches of the river affected by the storage.

Developed sites—The rating of developed sites will show:

(4) Power at the site to be determined in a manner similar to that for an undeveloped site.

(5) Manufacturers' ratings of limiting machine capacities expressed in kilowatts.

Merchandising the Electrically-Driven Domestic Water System

By V. H. Moon

Appliance Sales Superintendent, Pacific Power & Light Company, Portland

POWER companies serving rural territories have long realized that the automatically-operated, electrically-driven, domestic water supply system on farms or in rural communities not enjoying gravity distribution of water is an excellent piece of equipment to exploit. In the first place its utility to the user is great. If it replaces a hand pump it lightens the labor in the home immeasurably and introduces the approximate equivalent of the water service received by urban dwellers with all the health and sanitation features and convenience this service carries with it. If it replaces a gasoline engine it does away with the work of starting and stopping such engines by hand and with the trouble which invariably accompanies their long running. In the second place it is a good load for the power company, primarily because of its small connected load and its comparatively high load factor, and though no accurate data are available, it is estimated that the diversity in the case of any considerable saturation of such pumps is great.

Besides these advantageous features, the domestic electric pump is an excellent entering wedge for introducing to the farmer the advantages of other applications of electricity to his domestic and farm work problems. It accustoms him to paying a higher bill, which he does not regret because of the value of the service, and becoming thus acquainted with what electricity can do for him in solving this important problem of his home, he is more receptive to other uses as they are suggested to him by the power company salesman. In short it helps sell him other electrical appliances and devices.

Granting, then, that the electric pump is a desirable load, the problem from the power company standpoint is one of determining if existing sales outlets for the device are satisfactory for securing a high degree of saturation on its rural lines. The commercial manager must decide whether or not to merchandise this particular appliance or leave it to other dealers, and his decision will be based on his knowledge of the situation respecting the distribution of the device in the territory served by his company, and on his judgment as to whether or not he can merchandise such a specialized piece of equipment satisfactorily.

The Pacific Power & Light Company has given considerable thought to this problem for some years, and decided that by merchandising the device itself a much greater degree of saturation could be secured in certain districts where the device was particularly adaptable. Further, the addition of this device to the general line of appliances would help to swell the volume of merchandise sold in rural communities, which always had run less per customer than the volume in urban territory.

At first the plan was to sell through the regular appliance salesmen, who would work the device along with the rest of their line. The company standardized on the Paul pump manfactured by the Fort Wayne Engineering & Manufacturing Company, and placed a demonstrator of the most commonly used type in all its salesrooms. When a prospect was secured, it was frequently necessary to call in the manufacturer's representative in the territory for engineering advice as to just what type and size installation would best suit the prospect's needs, and for selling help. Ordinarily the necessary unit was ordered from the manufacturer's representative specially for each job, though in a few districts the most commonly used size and type unit was stocked in small quantities so that immediate installation could be made when these units were sold. The wiring and plumbing for the installation was invariably allotted to local wiremen and plumbers, and in the more complicated cases a representative of the manufacturer's agent supervised the pluming part of the job.

Arrangement was made to grant credit to the purchaser where credit was warranted. The manufacturer's list plus freight was established as the cash price, and suitable amounts were added in establishing prices when the account was to be carried for a year or eighteen months. Installation was extra and was paid directly to the plumber and wireman by the purchaser. Responsibility for servicing was accepted by the company and was charged for in all cases not covered by the manufacturer's guarantee. Servicing, however, was not burdensome, and did not present a serious problem.

This merchandising plan, which remained in effect for a few years was productive of some business, but it was recognized that if the field were cultivated more intensively, a considerably higher saturation could be reached and the volume of merchandise sales to rural customers could be increased.

It was seen that the amount of help furnished for a majority of the sales by the manufacturer's representative created an expense which must be reflected in the discount allowed to the company, and that if the manufacturer could be relieved of this expense, and if the company could purchase in larger volume, a greater discount could be allowed, thus leaving more margin for the promotion of this load building device.

The obvious way to produce this condition was for the company to put on its own specialty salesman, and thus free itself of the necessity of relying on expert assistance from the manufacturer. This would permit a more intelligent direction of the selling effort than had been possible under the old system and the added business that might be expected would make it possible to buy in the volume carrying the better discount. It was thought that with this larger margin the activity could be made to pay its way and thus desirable load would be added at no expense, with the possibility of making a merchandising profit. It was decided to experiment with this plan, and after several months' operation, it appears that the plan is working out satisfactorily to all concerned.

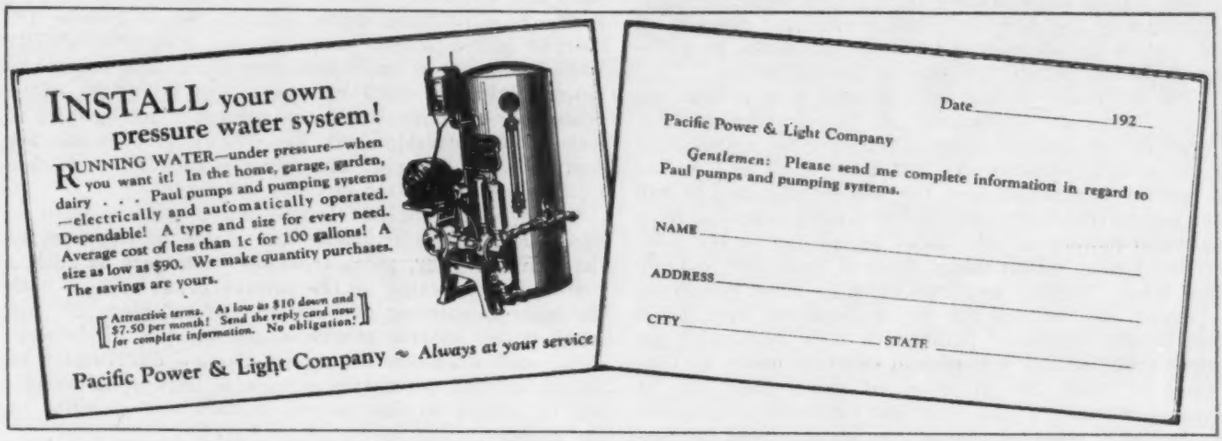
The man chosen for this special work was picked for his ability to sell to farmers rather than for his en-

gineering knowledge of pumps and pumping equipment. By way of preliminary training, he was sent to the headquarters of the representative of the Fort Wayne Engineering & Manufacturing Company in the Northwest, where he was allowed to work in the shop for a week so that he might learn as much as possible about the assembly of the equipment and absorb a knowledge of its sales features. He was then started out in the rural territory served by the company, calling on prospects already secured or finding new prospects by personal interview. He is paid a certain salary against which is charged a commission on each sale made, so that if his commissions exceed the guarantee in any month his compensation is increased by this difference. He owns his own automobile, which he uses to make calls, and he pays all his own expenses out of his compensation. He works in one of the districts of the company until its immediate possibilities are exhausted, when he goes on to the next, with the view to returning to the first to call back on live prospects that had originally deferred buying until some future date. He keeps a record of all calls, noting whether a sale was made or whether the customer is a prospect for a future sale and when, and incorporates this informaiton into weekly reports, which furnish the basis for directing his movements.

Only one form of advertising has been tried in connection with this activity. This is direct-by-mail advertising in the form of a postcard containing the appeal, with a return card attached on which the interested prospect may request further information. These are sent to a selected list of prospects by the district office about ten days before the pump salesman is to arrive in that territory, the idea being that he will make a personal call on all who have evidenced an interest in the proposition by sending the return card. In one instance five of these inquiries were received back from the mailing list to which the cards were sent out, and the pump salesman immediately sold four of these prospects.

The regular appliance salesmen still continue to secure prospects for the sale of pumps and work in close co-operation with the pump salesman. This co-operation is maintained through the operation of the bonus system in effect in the company. Briefly, this system operates to give extra compensation to all salesmen when the gross merchandise sales of the district exceed an established quarterly quota, and since the sale of pumps augments this gross business, the regular salesmen benefit from the sale of pumps as much as they do from the sale of any other appliance of this price.

It has been said above that the plan seems to be working out as expected. Actually the company is selling more electric water systems, is buying on the larger discount basis, and from a merchandising standpoint is just about breaking even on the amount of business secured since the plan went into effect last fall. The salesman's commissions have not yet exceeded his salary guarantee, but he is working up the business to a point where they may do so soon, and when this occurs the company will make a merchandising profit. In the meantime the desirable pump load is being added to the lines faster than it was being added under the old plan. In addition, other benefits are accruing to the company in that an excellent contact is being made with farmers. Many small differences are being straightened out, and confidence in the company and its operating methods is being established among a class of customers with which, on account of distances involved, it is difficult otherwise to maintain adequate contact. The company is satisfied with the results of the experiment, and in fact, on account of the size of the territory to be covered, is comtemplating putting on another pump salesman.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Sample of direct-mail material used by Pacific Power & Light Company in selling electrically-driven domestic water systems.

F. G. Baum Discusses Transmission Line Stability

TO BE efficient and stable, a long electric power transmission system must be tuned like a radio receiver, according to F. G. Baum, consulting engineer for the Westinghouse Electric & Manufacturing Company, while recently discussing his newly patented system of long distance transmission employing the use of synchronous condensers at regular intervals along the line. In speaking of line stability Mr. Baum said:

"As everyone knows, a radio receiver must be in perfect tune with the station it is receiving in order to produce the most satisfactory results. We now know that the same principle applies to a long transmission line—by putting the line in perfect tune with the power waves it is transmitting, the maximum amount of power that can be transmitted over it for a given capital expenditure and the voltage can be maintained steady under all conditions of load instead of varying widely up or down as is the case with an imperfectly tuned line.

"In a radio receiver, inductance and capacity—or in

other words, coils and static condensers—are used to effect tuning, and the process consists in varying either, or both, until the circuit falls into tune with the received wave. In my power transmission system, I use precisely the same elements. The inductance is supplied by the line itself and I add to the fixed capacity of the transmission line variable capacity in the form of so-called 'synchronous condensers,' which are connected to the high-voltage transmission line at intervals of about 100 miles.

"These rotating 'synchronous condensers' are special electric generators which 'float' on the line and have the power of varying the effective capacity of the system. They automatically regulate the electrical characteristics of the line itself and change the capacity of the system in accordance with requirements to maintain constant voltage for varying power flow.

"The net result of this arrangement is to remove the present distance limitations of power transmission. Power in any desired volume can now be transmitted as far as it is economically justifiable to do so. As far as can be determined now the longest distance it will ever pay to transmit power in the United States is from the water-powers of the Rocky Mountains to the Mississippi Valley, which means lines of from 500 to 1,000 miles long. Similar problems exist in other countries.

"Power can be received by or supplied from these lines at any regulated point with little additional expense; their voltage will remain constant under all conditions of load; the direction of power flow can be reversed at will; simple and less expensive generators can be used; transformers can be standardized for single voltages; stresses on the insulators are reduced to a minimum; and the system becomes stable.

"While electric power probably never will be transmitted directly more than 1,000 miles in the United States, we can look forward to interconnected power net-works covering very large areas and eventually nation-wide in scale.

"It is easily seen that such a national power system will make much better use of the potential power sources of the country, because the system will be so large as best to make use of the varying power characteristics in the various sections. Such a system will also obtain advantage from the time difference between East and West.

"Such a national power system would reduce the costs of power to local companies and industries, greatly reduce the cost of main line railway electrification, and develop business along railways, thus giving an added reason for electrification; it would cause acceleration of water-power developments and result in demands for capital, labor, copper, aluminum, hydraulic and electrical machinery, steel, etc.

"Such a system of electric power transmission is necessary for the economic and stable development of the country. For, aside from the economics of such a system in connecting up the surplus power sources with the large consuming markets and in bringing into use many power sources otherwise not feasible of development, such a system will bring about a distribution of industries and population otherwise impossible, resulting in adding to the general welfare and stability of the country."

Statistical Study of Uses of Electricity in California Agriculture

By Ben D. Moses

Director and Secretary, California Committee on the Relation of Electricity to Agriculture, Davis, California

WHEN the California Committee on the Relation of Electricity to Agriculture was organized in 1925, one of the subcommittees undertook surveys of the present uses of electricity on California farms. One of these surveys was in the form of a questionnaire sent to all power companies selling energy in the state and contained questions as to the number of rural consumers, the amount of energy used in rural farming distircts and the revenue derived from agricultural load. The other survey was in the form of a postcard questionnaire that contained questions on detailed uses of electricity. It was mailed to all farmers in the state being served by central stations.

After a careful study of the conditions under which the postcards were handled and by comparing the results from the returns with other surveys and statistics, tables have been prepared that the committee believes give a fair picture of the extent and variety of uses of electricity in the farming districts of California. The committee feels that if anything, the results are conservative. It also wishes to point out that all results are for the year 1925 and no account is taken of the growth that might have occurred during the succeeding two years.

Table I shows the number of consumers on the lines of all central stations in the state residing outside of incorporated towns or cities; it also shows the classification of consumers as between lighting only, heating and cooking, and power. The figures presented are exclusive of large industrial consumers such as cement mills, packing plants, mines and the like. They include however not only actual farmers, but also a great many suburban residences that cannot be classed as rural. Consumer records permit of a very accurate check of the total number of customers but a certain amount of estimating has been necessary on the part of some companies to segregate the load into lighting, cooking and heating and power.

Each district covered has been carefully studied by the central stations and each manager's intimate knowledge of the characteristics of his particular territory has permitted of a close estimate of the actual agricultural consumers and those that are not. In arriving at the number of farms served, a farm was defined as follows: "A place will be called a farm that produces agricultural products and upon which either the owner, tenant or hired help depends for livelihood." The results of the estimates of the actual number of farm customers are shown in Table II.

It is perfectly possible that there are a number included who are not farmers but who merely have a small family orchard, raise a few chickens or have a back-

yard garden. On the other hand, there are a great many places within the limits of some of the cities and towns that are really farms, producing fruit, vegetables, eggs, poultry or milk, that will more than make up for such a discrepancy. As has been said before the committee feels that the data presented in Table II may be considered as conservative rather than extravagant.

Table III, showing actual agricultural power consumption, is compiled from a schedule that applies only to agricultural power and is, therefore, a correct record of the energy used on the farms for power purposes. It does not include any industrial plants nor any lighting, heating or cooking excepting such cases as poultry house lighting, brooders, incubators, electric dairy sterilizers and electric dehydrators.

Tables I, II and III were compiled from data furnished by the power companies. In Tables IV, V, VI and VII the results secured from the tabulation of the returns of the postcard questionnaires to actual farm consumers are presented. California power companies mailed out 48,852 of these questionnaires which contained space for 87 answers on the number and size of appliances used, acreage and crop, connected load in horsepower in motors and the purpose for which motors were used, and many other questions.

Out of this number 8,950 were filled out and returned. This number was so near 20 per cent that 5 was taken as a multiplication factor to apply to the results in order to determine the total number of appliances of any particular class in use on the farms of the state. In Tables IV, V, VI and VII both the number of appliances as reported on the 8,950 questionnaires returned and the estimated number in use on all farms computed by using the multiplication factor 5 are presented.

Table I—Electrical Consumers Residing Outside of Incorporated Cities and Towns Served by California Central Stations, 1925

Name of Company.	No. Having Lights	No. Having Cooking and Heating	No. Receiving Power
Southern California Edison Co.	94,060	4,580	13,450
San Joaquin Light & Power Corp.	15,220	1,490	8,870
Pacific Gas and Electric Co.	45,360	2,940	13,540
Coast Counties Gas & Electric Co.	5,090	320	1,470
Great Western Power Co.	6,700	1,000	2,400
Coast Valleys Gas & Electric Co.	800	80	560
Western States Gas & Electric Co.	3,720	460	3,180
Southern Sierras Power Co.	3,470	430	1,390
San Diego Cons. Gas & Electric Co.	4,150	820	1,350
Midland Counties Public Service Corp.	2,710	260	850
Turlock Irrigation District	2,500	770	810
The California Oregon Power Co.	320	40	40
Escondido Water Co.	330	60	180
Modesto Irrigation District	1,570	320	200
Ojai Power Co.	70	50	40
Vacaville Light & Power Co.	100	20	60
Anaheim Municipal Plant	30	.....	10
Los Angeles Gas & Electric Corp.	.....	.....	10
Napa Valley Electric Co.	330	10	50
Alex Brown	10	.....	.....
Indian Valley Power Co.	20	.....	.....
Totals	186,560	13,650	48,460
Total number receiving service			210,000

Table II—Estimated Number of Agricultural Consumers on Lines of California Central Stations, 1925

Name of Company.	No. Having Lights	No. Having Cooking and Heating	No. Receiving Power
Southern California Edison Co.	12,000	2,290	10,760
San Joaquin Light & Power Corp.	7,380	1,200	7,710
Pacific Gas and Electric Co.	11,800	2,210	10,830
Southern Sierras Power Co.	3,300	230	1,060
Coast Counties Gas & Electric Co.	2,540	320	1,320
Great Western Power Co.	1,670	500	2,040
Coast Valleys Gas & Electric Co.	720	70	500
Western States Gas & Electric Co.	3,530	410	3,120
San Diego Cons. Gas & Electric Co.	1,450	570	1,280
Midland Counties Public Service Corp.	410	30	340
Turlock Irrigation District	2,500	770	810
The California Oregon Power Co.	230	20	40
Escondido Water Co.	330	60	180
Modesto Irrigation District	1,570	330	200
Ojai Power Co.	30	20	40
Vacaville Light & Power Co.	50	10	30
Anaheim Municipal Plant	20	10	.....
Los Angeles Gas & Electric Corp.	.....	.....	10
Napa Valley Electric Co.	260	10	50
Alex Brown	10	.....	.....
Indian Valley Power Co.	.....	.....	.....
Totals	49,800	9,060	40,320
Total number receiving service			51,000

Table III—Actual Agricultural Power Consumption, Connected Load and Revenue (does not include domestic uses) for California Central Stations, 1925

Name of Company	Hp. Connected Load (Power Only)	Kw-hr. Total Consumption (Power Only)	Revenue from Agricultural Power Load
Southern Calif. Edison Co.	197,471	293,403,213	$4,021,987.68
San Joaquin Lt. & Pwr. Corp.	94,278	164,150,850	2,252,976.22
Pacific Gas and Electric Co.	195,552	122,176,318	2,126,725.69
Southern Sierras Power Co.	21,489	40,752,863	678,750.00
Coast Counties Gas & Elec. Co.	15,459	13,266,126*	416,579.56*
Great Western Power Co.	41,000	17,807,000	345,700.00
Coast Valleys Gas & Elec. Co.	12,005	21,441,663	345,060.55
Western State Gas & Elec. Co.	23,935	8,018,260	239,512.49
San Diego Cons. Gas & El. Co.	7,800	7,600,000	197,775.00
Midland Co. Public Serv. Co.	8,510	7,275,898	140,292.00
Turlock Irrigation District	8,500	7,900,000	113,000.00**
The California Ore. Power Co.	3,902	5,426,594	48,901.21
Escondido Water Co.	755	566,368	20,741.95
Modesto Irrigation District	2,111	1,018,074	19,503.37
Ojai Power Co.	1,641	1,045,996	17,933.22
Vacaville Light & Power Co.	.....	262,129	8,925.83
Anaheim Municipal Plant	500	263,985	6,120.00
Los Angeles Gas & Elec. Corp.	286	349,505	5,269.36
Napa Valley Electric Co.	590	189,161	4,925.27
Alex Brown	112	33,484	1,097.39
Indian Valley Power Co.	17	.....	917.36
Totals	635,913	712,947,487	$11,010,694.15

*Includes power, heating and cooking.
**Part of the information is estimated but with a probable error of not more than 10 per cent.

Totals and Averages

Rural customers receiving service	210,000
Rural customers receiving lighting service	186,560
Rural customers receiving heating and cooking service	13,650
Rural customers receiving power service	48,460
Farmers receiving service	51,000
Farmers receiving lighting service	49,800
Farmers receiving cooking and heating service	9,060
Farmers receiving power service	40,320
Total hp. connected agricultural power load	635,913
Total kw-hr. consumed for agricultural power	712,947,487
Total annual revenue agricultural power load	$11,010,694.15
Average connected load (power only)	15.77 hp.
Average annual consumption (power only)	17,652 kw-hr.
Average annual revenue (power only)	$273.08
Average price per kw-hr. (power only)	$.0154
Per cent of farmers receiving service	40

Table V—Elecrtic Household Appliances in Use on California Farms, 1925

Appliance	No. of Units: On Cards	No. of Units: Total for California	Appliance	No. of Units: On Cards	No. of Units: Total for California
Ranges	2,254	11,300	Waffle irons	1,284	6,420
Water heaters	1,341	6,710	Table grills	1,096	5,480
Washing machines	3,608	18,000	Curling irons	2,396	11,980
Space heaters	1,889	9,360	Immersion heaters	211	1,000
Sewing machines	1,281	6,400	Heating pads	1,064	5,320
Vacuum Cleaners	3,571	17,800	Dish washers	34	170
Flat irons	6,950	34,800	Portable fans	2,011	10,000
Mangles	164	820	Bell transformers	993	4,980
Percolators	1,839	9,200	Other uses	2,186	10,900
Toasters	3,397	17,000			

Table VI—Electric Lights in Use on California Farms, 1925

Location	No. of Units: On Cards	No. of Units: Total for California	Location	No. of Units: On Cards	No. of Units: Total for California
Residence	105,538	527,700	Pump house	5,428	27,100
Barn	9,730	48,700	Poultry house	9,142	45,700
Shop	3,535	17,680	Yard	5,237	26,200
Dairy	3,732	18,700	Garage	4,488	22,400

Table VII—Miscellaneous Electrical Appliances in Use on California Farms, 1925

Appliance	No. of Units: On Cards	No. of Units: Total for California	Appliance	No. of Units: On Cards	No. of Units: Total for California
Trucks	4	20	Incubators	1,140	5,700
Horse clippers	36	180	Battery chargers	1,025	5,130
Sheep shears	4	20	Other uses	140	700
Poultry brooders	879	4,400			

Engineering Practice

Construction and Use of Kilowatt-Kilowatthour Curve

Easily Constructed Curve Facilitates Economical Allocation of Various Power Resources in Planning for Future Loads

By A. WILSTAM, Southern California Edison Company, Los Angeles

ECONOMICAL operation of a large electric service system and advantageous use of power production resources requires a proper division and assignment of the total system load among the various classes of generating equipment on the system. On systems using steam plants exclusively a proper allocating of load to the various steam generating units according to their operating efficiencies is essential to low production costs.

If the utility utilizes both water and steam power the importance of designating the right position in the load curve to the various power resources becomes of paramount importance. A utility may generate power from stream-flow plants without water storage and where the daily power generated is practically constant. This power may be considered as 24-hr. base power. Power generated from stored water in an up-to-date plant is regulated easily and may be governed to take most, if not all, of the daily load variation up to the capacity of its generators or water supply. Steam units of high efficiency may be operated at their best rated efficiency on block loads and other steam plants or units of lesser efficiency may be used to advantage on peak loads.

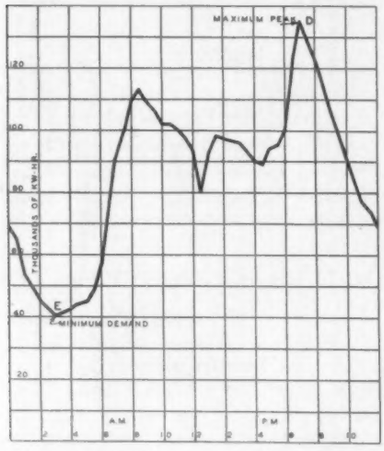


Fig. 1. Typical daily system load chart for a day in June, 1917. Total kw-hr. for day, 2,070,000.

While application of these principles is more or less common among power companies, computation methods usually are somewhat involved and tedious. Calculation of such a load division is simplified greatly by the use of a curve which has been designated as a "kilowatt-kilowatthour" curve. This curve shows the kw-hr. contained in the load for each increment of kw. demand and from it any point on the load curve can be interpreted directly into kw. and kw-hr. or from one into the other. This permits a ready application to the system load of any block load or power resource and permits its proper allocation within the load and with reference to respective load factors and general importance.

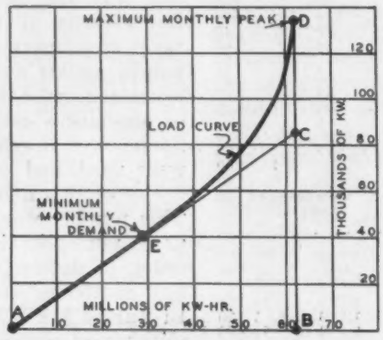


Fig. 2. Kilowatt-kilowatthour curve constructed from data on daily load curve of Fig. 1.

Load Studies

Frequently it becomes necessary for various reasons to study the relations between the output and the plant capacity of part of an electric system as distinguished from the whole capacity and the whole load. For example, it may be desired in a system of say 100,000-kw. capacity to know how many kw-hr. will be absorbed by the load between the 50,000-kw. and 75,000-kw. loads, or how many kw-hr. lie below or above the 50,000-kw. line. One instance when such information is valuable is in estimating fuel costs for a year in the future. Where it is desired to get the greatest use out of the more efficient units and hold those of low efficiencies for peak-load service, it is well to forecast the output of each kind of plant and to predict the amount of fuel to be required by each.

The Southern California Edison Company operates a number of steam and hydro plants, some of the latter operating from stored water. For a number of years the company has given serious study to economical production and to a balanced proportion of steam and water power most suitable to conditions existing in central and southern California. To meet the constantly growing power market the company has been compelled to program its operations some years in advance. It was due to this effort that in 1916 a certain load curve was devised which has proved to be of great value in this estimating of future loads.

This basic curve is shown in Figs. 2, 3, 4 and 5. It can be made to apply to days, months, or years, but the monthly curve is the one most suitable for general purposes. The longer the period considered the more accurate the curve will be.

Curve Construction Method

A daily system load curve such as usually is plotted and kept by most power companies is shown in Fig. 1. From a curve of this kind, or from records from which it is made, the basic load curve particularly referred to in this article may be made up. A reproduction of the first kilowatt-kilowatthour curve regularly made and kept in the files of the Edison company is shown in Fig. 2 and represents the load as of June, 1917. By examining the curve it may be seen that the total output for the month was 62 kw-hr., the maximum peak 135,000 kw. and the minimum demand during the month 40,000 kw. This load curve was made up from completed monthly records of the kw. readings of the total system load taken at ½ hr. intervals dur-

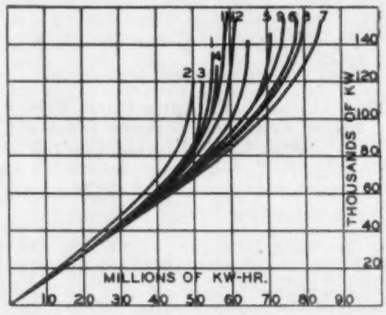


Fig. 3. Comparison of kilowatt-kilowatthour curves for the 12 months of 1918. Numbers on curves denote consecutive months of the year.

ing the month. The method of construction is as follows:

1. Use suitable cross-section paper marked with a horizontal scale to represent millions of kw-hr. and a vertical scale to represent kw. See Fig. 2.

2. Make the distance on the horizontal line AB equal to the output in kw-hr. for the month. From B draw a vertical line BD to represent the kw. demand, point D being the maximum peak for the month. Locate a point C on line BD corresponding to a kw. demand at 100 per cent load factor. Draw straight line AC. Locate E on line AC, this point representing the minimum demand in kw. for the month. From E to D finish the curve by plotting from the records of the hourly readings as indicated below.

3. At point E (see Figs. 1 and 2) the minimum monthly demand is shown to be 40,000 kw. which means that a 40,000-kw. load has been maintained throughout the whole month or for all of the 720 hr. of the month. Thus the kw-hr. at this point is $720 \times 40{,}000 = 28.8$ million. This point E on the curve represents a load at a power factor of 100 per cent.

4. At a point indicated by, say, 80,000 kw. the area (see Fig. 1) between a line drawn horizontally through this point and a line drawn similarly through point E at 40,000 kw. is found, by compiling the hourly or half-hourly readings, to contain 22.2 million kw-hr. Therefore, the total kw-hr. at this point on the curve, as shown in Fig. 2, should be $28.8 + 22.2 = 51$ million. Thus the curve will run through a point indicated by 80,000 kw. and 51 million kw-hr. This point we will call X.

5. At a point indicated by 100,000 kw. the area between this point and point X is found, as above outlined, to contain 6.5 million kw-hr. The total kw-hr. at this point then is $51 + 6.5 = 75.5$ million. The curve therefore will run through a point indicated by 100,000 kw. and 57.5 million kw-hr. This point we will call Y.

6. Point D as shown in Fig. 2 is indicative of the total kw-hr. and the maximum kw. for the month.

7. The curve then as plotted can be drawn from A to E and through points X and Y to D.

8. Of course the above seven points indicate only the general method of curve construction. When actually making the curve sufficient points should be taken and the curve should be made large enough for practical purposes.

This kind of curve was plotted from actual data for each month from June, 1917, to January, 1923. This laborious method then was discontinued because it was found that, when the kw-hr. output, maximum monthly kw. peak, and minimum monthly kw. demand were known, a curve good enough for estimating purposes could be constructed in a few minutes.

Twelve of these total monthly system load curves as plotted for the year 1918 are shown in a comparative group in Fig. 3.

Simplified Curve Construction

The monthly system load curve as now being used is shown in Fig. 4. To construct this curve the following three factors are necessary:

1. Monthly output in kw-hr.
2. Maximum monthly peak in kw.
3. Minimum demand in kw. during month.

To construct the curve (see Fig. 4) draw line AB equal to kw-hr. output for the month. From B draw a vertical line BD equal to the maximum demand in kw. for the month. Locate C on line BD, point C corresponding to the kw. demand for the month for 100 per cent load factor. Connect A with C by straight line. Locate E on line AC, this point being the minimum demand in kw. during the month. From E to D construct a parabolic curve with tangent points at E and D as shown. Then the curve A-E-D is the monthly load curve in question.

It may be seen by examining this chart that the breaking off from 100 per cent load factor occurs at E. In this particular case E is at 40,000 kw. and 28,800,000 kw-hr. Also it may be seen that the load factor beyond E varies from 100 per cent at E to zero at D.

Use of Curve

The primary purpose for which this curve was developed was to allocate properly the available resources to serve a future estimated load and in such a way as to get the most from those resources with the least expense. Fig. 5 illustrates the application of resources to an estimated monthly load for a power company having both hydroelectric and steam plants. Referring to the chart it may be seen that the allocation of the available resources is as follows:

	Kw-hr.	Kw.
Stream-flow plant without storage at base of load, 100 per cent daily load factor	14,500,000	20,000
Most economical loading on high efficient steam plants or units	21,000,000	30,000
Water power from stored water, up to plant capacity limited by the annual distribution of water supply	22,000,000	50,000
Steam power over peak	4,500,000	35,000
Total estimated monthly load	62,000,000	135,000

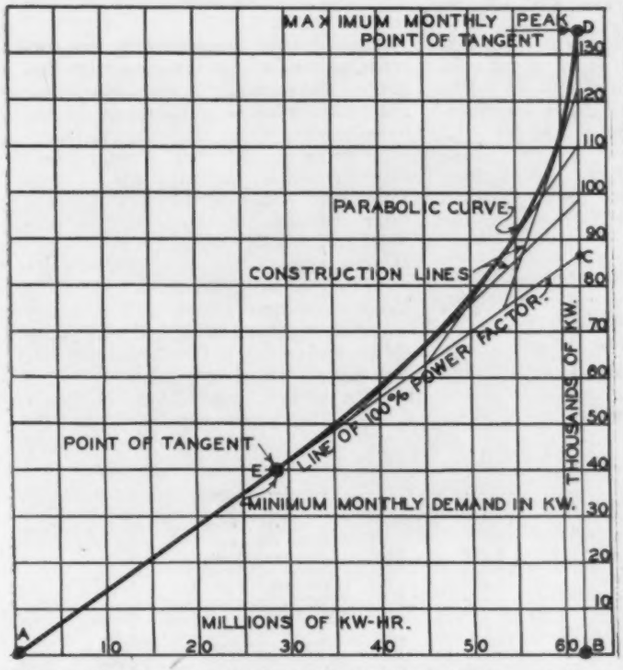


Fig. 4. Method of constructing kilowatt-kilowatthour curve showing total monthly system load for June, 1917. Thirty-day month = 720 hr.; max. peak = 135,000 kw.; total output = 62,000,000 kw-hr.; load factor = 64 per cent; min. demand = 40,000 kw.

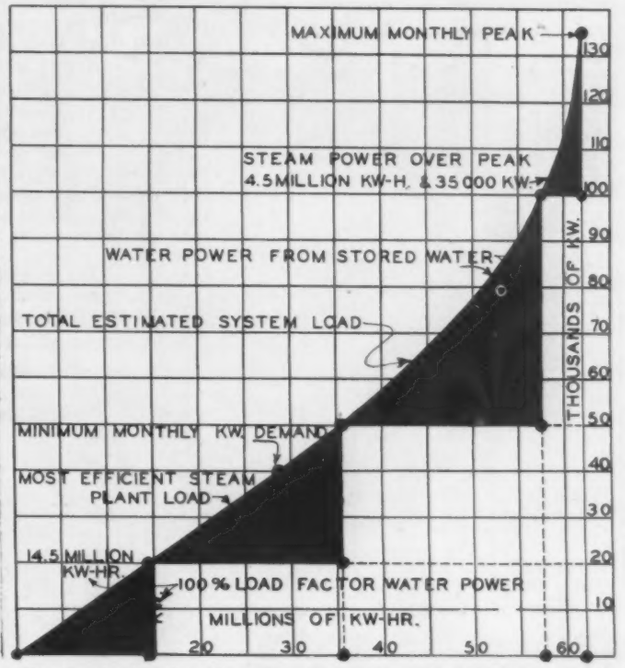


Fig. 5. Application of power resources to estimated future monthly load by use of kilowatt-kilowatthour curve. The assumed problem results in the load distribution indicated by shaded portions, abscissae and ordinates of which represent respectively kw-hr. and kw.

Analysis of Current Transformer Tests—III

"Zigzag" Connection of Three Current Transformers.

By E. C. GOODALE, Tacoma, Washington

A connection frequently used in meter and relay work is the "zigzag" connection of current transformers shown in the connection diagram of Fig. 13. Assuming the load to be balanced the line currents I_A, I_B and I_C will be 120 electrical degrees or ⅓ cycle apart as to phase. If the current transformer ratio is R, then $I_a = \frac{I_A}{R}$, $I_b = \frac{I_B}{R}$, and $I_c = \frac{I_C}{R}$.

These are shown graphically in the vector diagram of Fig. 13.

Currents in tap lines ad, bd and cd can be determined by applying to points a, b, and c, in turn, the modification of Kirchoff's Law:

The current leaving a junction point in any conductor equals the total current entering, minus any other currents leaving the junction point.

Thus in Fig. 13:
At point a, $I_d = I_a - I_b$.
At point b, $I_e = I_b - I_c$.
At point c, $I_f = I_c - I_a$.

These subtractions are vectorial and since to subtract vectorially it is necessary only to reverse the direction of the negative vectors and add in a "heel-and-toe" manner, the results are as shown by vectors I_b, I_e, and I_f in the vector diagram of Fig. 13. For balanced conditions each of these resultant currents will be numerically equal to 1.73 times the secondary current of either of the current transformers, respectively, involved.

Such results thus are subject to prediction through the use of Kirchoff's Law and these results are verified by data obtained under actual test conditions.

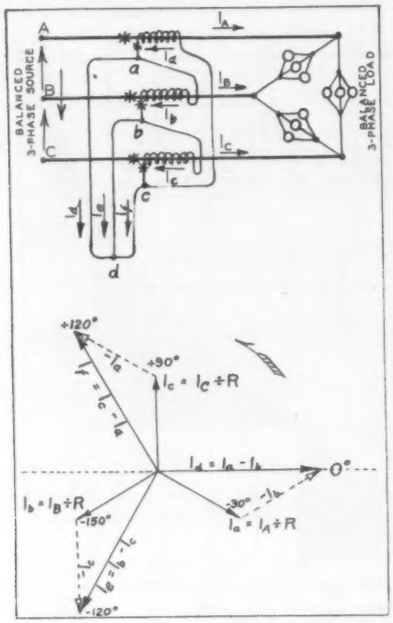


Fig. 13. Schematic circuit diagram of "zigzag" connection of current transformers (above) and vector diagram showing current combinations (below). Asterisks denote polarity.

Actual Test Results

A 3-phase balanced load consisting of three 250-watt lamps in parallel across each phase of the line was used to draw current from a 3-phase 3-wire line. The values and phase relations of the various currents and voltages were obtained with the equipment indicated in Fig. 14. The method of procedure was described in detail in Part II of this series. (See p. 210, Electrical West, April, 1927.) The accompanying table shows test results. Fig. 13 shows the test connection diagram and Fig. 15 shows a complete vector diagram. For this test the current transformer ratios were 10/5, the reference voltage $E_{BA} = 114$ volts and the reference current a value of 10 amp. in phase with the reference voltage.

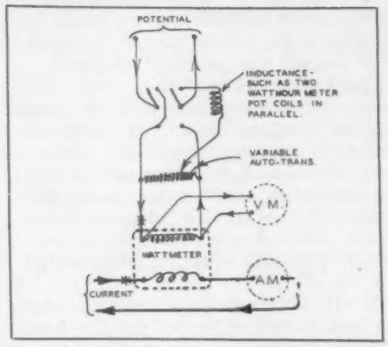


Fig. 14. Circuit diagram for measuring and phasing test.

From these tests it may be seen that Kirchoff's current law is borne out quite accurately, the actual diagram of Fig. 15 comparing closely with the theoretical vector diagram of Fig. 13.

Tests for unbalanced load were made with one 250-watt lamp across phase BA, two lamps across phase CB, and three across phase AC. Line currents then were:

$I_A = 7.65$ at 49-deg. lag.
$I_B = 6.00$ at 139-deg. lag.
$I_C = 9.30$ at 93-deg. lead.

Secondary currents were:

$I_a = 3.90$ at 49-deg. lag.
$I_b = 3.05$ at 142-deg. lag.
$I_c = 4.80$ at 92-deg. lead.

Tap currents were:

$I_d = 5.16$ at 19-deg. lag.
$I_e = 7.00$ at 109-deg. lag.
$I_f = 8.20$ at 109-deg. lead.

Here I_d was equal to $I_a - I_b$; I_e was equal to $I_b - I_c$; and I_f was equal to $I_c - I_a$.

Differential Protection of Transformers

A frequently used application of this connection is in the differential protection of a delta-star or star-delta transformer bank. The a.c. connections for such protection are shown in Fig. 16. The currents I_A, I_B and I_C drawn by the load from the star secondary of the bank appear in the primary in the directions shown. Consequently the currents in the primary line will be I_A-I_C, I_B-I_A, and I_C-I_B. These therefore will appear also in the current transformer secondaries on the delta side of the bank.

Line currents on the delta side, however, are out of phase with the line currents on the star side, each of the former being made up of the vector difference between two secondary line currents as indicated on the connection diagram. Consequently these same vector differences must be combined in the tap lines leading from the current transformers on the star side to the current transformers on the delta side. Otherwise there would be different currents forced through the relays since a current transformer builds up a high reactance against the flow through its secondary of any current not equal to its primary current divided by its ratio.

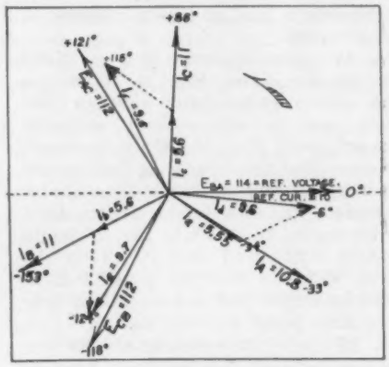


Fig. 15. Vector diagram showing phase relations of test data shown in accompanying table.

The same connection will hold correctly whether the star be grounded, 4-wire, or 3-wire ungrounded. The unbalance in the load will be communicated to the delta side and will appear

TABLE II—TEST DATA.

	Volts or Amp.		Watts-Switch Down		Cosine of Angle	Angle (Deg.)	Registration-Switch Up	Lead (Pos.) or Lag (Neg.)
E_{BA}	114.00	+	1,140	+	1.0	0	Slight change	In phase
E_{CB}	112.00	—	530	—	0.473	118	Increased Neg.	Lag
E_{AC}	112.00	—	580	—	0.518	121	Decreased Neg.	Lead
I_A	10.80	+	1,035	+	0.835	33	Increased Pos.	Lag
I_B	11.00	—	1,120	—	0.895	153	Decreased Neg.	Lag
I_C	11.00	+	80	+	0.070	86	Negative	Lead
I_a	5.55	+	520	+	0.825	34	Increased Pos.	Lag
I_b	5.60	—	570	—	0.890	153	Decreased Neg.	Lag
I_c	5.60	+	50	+	0.080	86	Negative	Lead
I_d	9.60	+	1,100	+	0.995	6	Slight change	Lag
I_e	9.70	—	620	—	0.562	124	Decreased Neg.	Lag
I_f	9.60	—	465	—	0.427	115	Increased Neg.	Lead

in its current transformer secondaries, the currents in which still will be equal to those in the tap lines of the current transformers on the star side.

Any interior shortcircuit in the transformer such as shown at X in Fig. 16

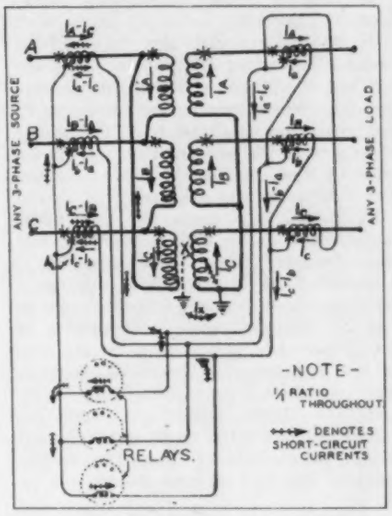


Fig. 16. Circuit diagram showing typical application of "zigzag" current transformer connection, in this case the internal protection of a transformer bank. Asterisks denote polarity.

will be accompanied by current flowing in on the source side but not appearing in the line going to the load. Hence in the current transformer secondary circuit the current increment due to the short will flow in a local path through two relays and through the secondaries of the current transformer through the primaries of which is flowing the short-circuit current.

Short circuit current will not flow in the secondaries of the current transformers on the load side since it does not flow in their primaries. Any attempt on the part of the short-circuit current to find a return path through these load-side current transformers would result in high reactance voltage building up and choking it out.

The next article of this series will deal with Z-connected current transformers.

EDITOR'S NOTE: This is the third of a series of articles prepared by Mr. Goodale and built around actual tests of various instrument transformer connections as made in the meter testing laboratory of the Syracuse Lighting Company, Syracuse, N. Y. The next article will analyze "Z" connections.

Electric Logging Locomotive Superior to Steam

Comparative locomotive operating tests staged on the properties of the Red River Lumber Company in northern California during the past season have brought out some interesting figures. For a period of time two 100-ton locomotives, one an oil-electric and the other an ordinary steam locomotive were engaged on this property in exactly the same kind of work. In common with other logging jobs the work involved the hauling of heavily loaded cars to the mill and the return of strings of empties from the mill to the scene of cutting operations. Grades and curves involved on these logging railroads of course are excessive.

During a 2-day test period the flexibility and operating characteristics of the oil-electric locomotive permitted greater acceleration on grade work and enabled it to outdo its steam competitor decisively. The operating record covering the hours of actual service of each locomotive showed that the average for the oil-electric locomotive was 2,530 ton miles per hour while the steam locomotive showed 1,424 ton miles per hour.

According to the report during 26 hours of actual work the fuel consumption for the steam locomotive totaled 1,370 gal. of fuel oil while the oil-electric locomotive consumed 180 gal. of fuel oil. Inasmuch as the market price of oil used by the two locomotives was the same the comparison in operating economy is direct. The average cost of fuel oil for the steam locomotive was $1.85 per 1,000 ton-miles while the fuel cost for the oil-electric locomotive was 18.75 cents per 1,000 ton-miles. The investment cost represented by the two locomotives was essentially identical.

Electro-deposition of rubber by a recently perfected process bids fair to bring about notable changes in the rubber industry. In the operation of this new scheme a solution of rubber is electroplated upon a mold which mold serves as the anode of the electroplating circuit. Rubber so deposited is reported to be exceptionally homogeneous and resilient and the thickness of the deposition may be regulated at will according to the use of the article under formation. Rubber so deposited is accredited with extreme strength. It seems to be quite within normal expectation that the application of this method of rubber deposition may be adopted to the manufacture of rubber insulated wire and other such articles.

Reinforced Concrete Replaces Wooden Flume

Two views of the rebuilt section of the water conduit for the Bull Run hydroelectric plant of the Portland Electric Power Company. At the left may be seen the transition between a section of the concrete lined ditch and a 90-ft. section of metal flume that was installed for a service test. At the right is shown one of the portals of a 444-ft. tunnel. Some 17,000 ft. of rectangular wooden flume known as the Little Sandy Flume has been in continuous operation since 1912 and its reconstruction and partial relocation is scheduled to proceed in progressive steps. The job herewith pictured covered the lower 2,000 ft. of the flume and represents the first step. The line was partially relocated resulting in 1,590 ft. of the new conduit replacing 2,000 ft. on the old conduit.

Arrangement of Denver Terminal Substation Provides Flexibility in Operation

By L. M. ROBERTSON, Transmission Engineering Department, Public Service Company of Colorado, Denver

Denver Terminal substation was constructed in 1924 and has taken a very important position in the transmission system of the Public Service Company of Colorado. It serves as a tie-in between the Denver distribution system and two plants outside the city. The station site is adjacent to one of the older steam plants and practically at the center of the 13-kv. load district, an ideal location for such a station.

Original Development

At the same time that the Velmont steam plant was built a double-circuit tower line was built in to Denver. However, only one circuit was placed on the towers as that capacity was sufficient for the time being. The Boulder-Valmont 90-kv. tie-line was constructed at the same time, but the Boulder-Denver 90-kv. line had been operating for several years and it was necessary only to extend it 2½ miles to connect into the Terminal substation in Denver. The station was placed in service Dec. 1, 1924.

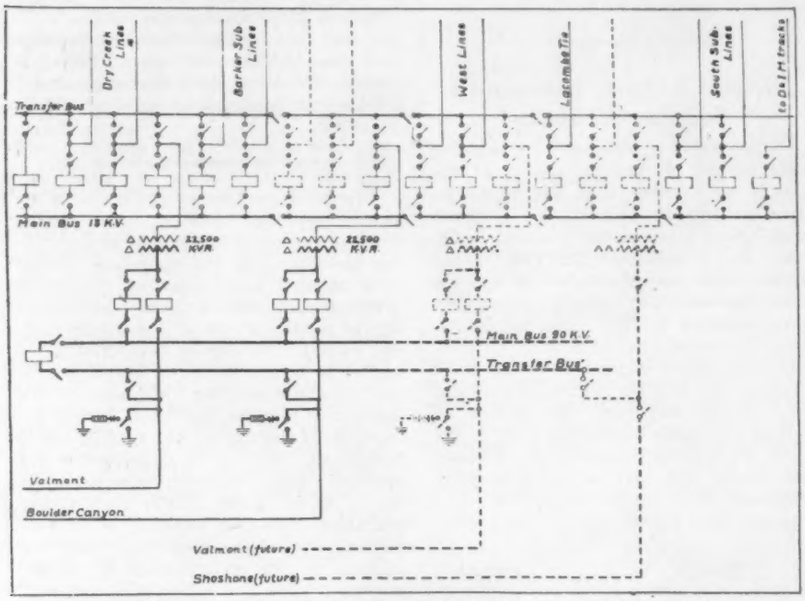


Fig. 1. One-line diagram of Denver Terminal substation, present and future.

Power at 90 kv. is received through two transmission lines, one from the Valmont steam plant and the other from Boulder Canyon hydro plant. A 90-kv. tie line between Valmont and Boulder Canyon forms a triangular 90-kv. loop with the Denver Terminal substation at one corner and Valmont plant and Boulder Canyon plant at the other corners. This loop is sectionalized automatically at each station by the operation of CZ-relays as has been described in a previous article. (See Electrical West, March, 1927, p. 148.)

The original installation included three 7,500-kva. sigle-phase, 90/13-kv. transformers and a spare, making a 22,500-kva. bank. This is the bank on the Valmont line, as shown in Fig. 1. The bank on Boulder Canyon line, one of the 90-kv. oil circuit breakers on the Boulder Canyon line, as well as the oil circuit breaker on the 13-kv. side of the Boulder Canyon transformer bank, were added later. All 13-kv. feeders, as shown in solid lines in Fig. 1, and the 90-kv. and 13-kv. bus-tie breakers were installed on the original job.

1926 and Future Additions

In 1926 a second 22,500-kva. transformer bank was installed along with one 90-kv. breaker and one 13-kv. breaker and other equipment. This additional equipment was put into service Oct. 27, 1926. This raised the capacity of the station to 45,000 kva., the status of affairs at the present time, as shown in solid lines in Fig. 1. This addition was similar to the original.

Provisions are made for two additional transmission line connections and three feeders, as may be noted in Fig. 1. Adjacent to the control house is space for synchronous condensers as shown in Fig. 3. The Shoshone line position is not proposed to be the same as the rest of the transmission positions because this line is not a part of the 90-kv. loop system. Many advantages will be gained by not tying it in normally although an emergency connection to the transfer bus will be provided.

Operation

It is possible to open the 90-kv. breaker between the main 90-kv. bus and each transformer bank and operate with a transmission line and a transformer bank as a unit, thus reducing short-circuit current values; or, the above mentioned breakers can be closed and all transformer banks or combinations operated in parallel. In order that short-circuit current values may be reduced still further the 13-kv. buses also can be sectionalized. The method of obtaining this arrangement is shown in the sectional elevation in Fig. 3. At present the interrupting capacity of all equipment exceeds the possible maximum short-circuit current and the transformer banks are operated in parallel and 13-kv. bus disconnects are normally closed.

Construction and Equipment

Fig. 2 gives a general idea of the type of construction and shows that it is well adapted for the particular arrangement used. The entire structure is made up of columns and trusses of galvanized steel members bolted together. The tower on the building

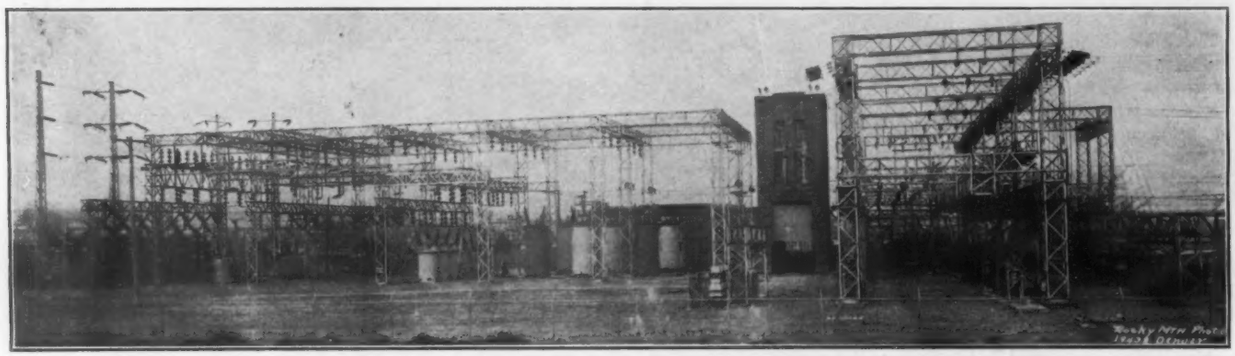


Fig. 2. General view of Denver Terminal substation.

which may be seen is a part of the control house built to provide space wherein to pull transformer cores.

Since the elevation of Denver is more than 5,000 ft. above sea level all electrical equipment is purchased with an over-voltage rating. The 90-kv. equipment is rated 110 kv. Feeders and their equipment probably will be changed at some time from 13 kv. delta to 22 kv. "Y." Therefore 37-kv. equipment has been used in feeder positions. All disconnects are stick-operated except those connecting 90-kv. transmission lines to the 90-kv. transfer bus. These are gang operated by hand. As shown in Figs. 1 and 3 one set of disconnects on each 90-kv. line serves either to connect an arrester to a line or to ground the line.

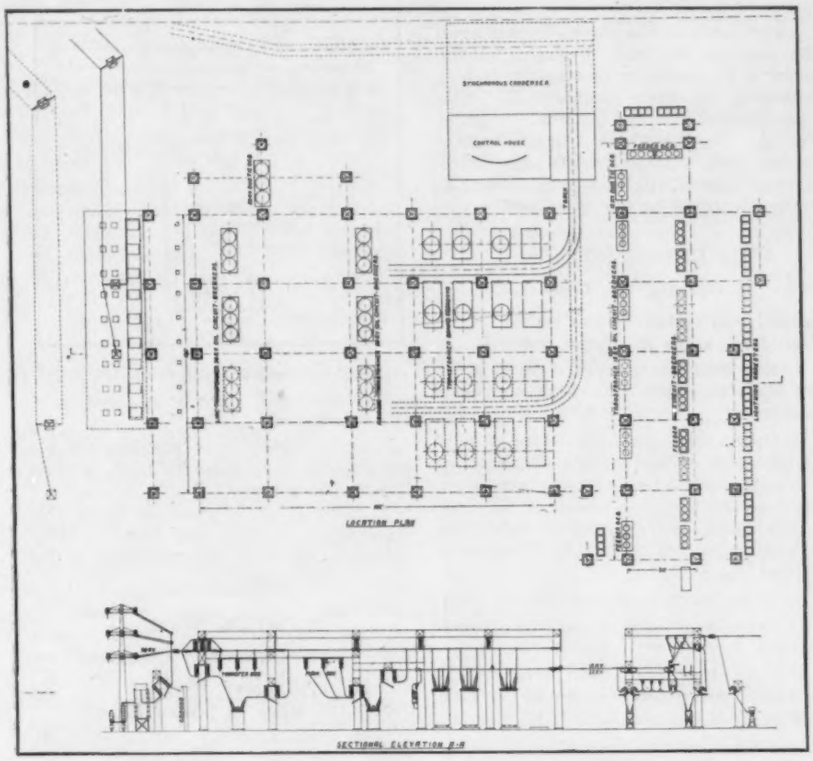
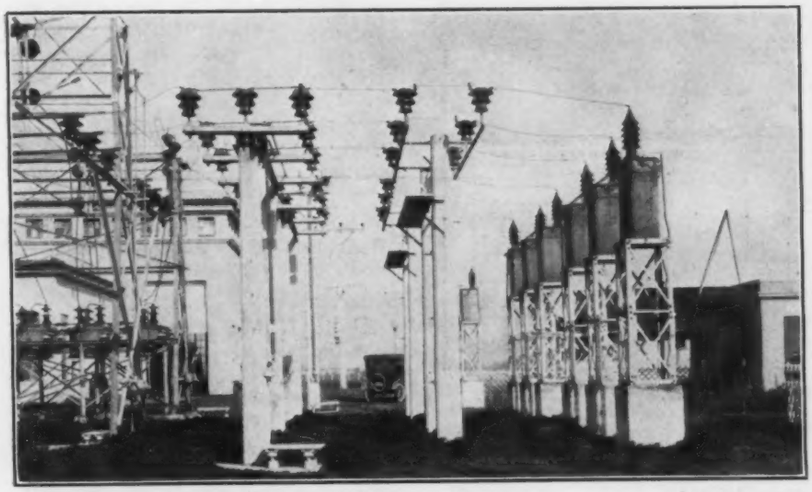


Fig. 2. Plan and elevation of ultimate development, Denver Terminal substation.

Instrument Transformer Set-Up



One of the standard 60-kv. potential transformer installations used at some of the substations of the Pacific Gas and Electric Company. In addition to mounting a potential transformer on the line side of each of the oil breakers a full set is provided for each of the two buses to supply instruments and relays. The concrete posts and the arrangements of air-break switches and fuses makes a neat and flexible job.

Effective Bulletin

—*D. T. & I. R. R. News.*

Watthour Meters Used as D.C. Reverse-Current Relays

Trouble in a railway substation incident to racing of rotary converters upon interruption of the a.c. supply was remedied by the use of two Sangamo type D-5 d.c. watthour meters arranged to act as reverse-current relays. Potential coils of the two meters were both connected across the main buses and the cables leading to the machines were spanned as shunts. The span on one of the cables was used to form the armature connection for one of the meters and the span on the other cable to form the armature connection for the other meter.

The trains were removed from the two meters and leads were brought from the trip coil of the no-voltage release attachments on the machine circuit breakers. Each coil was connected to special contacts placed inside the corresponding meter. One of the meter contacts was stationary while the other was mounted on the meter disk. A stop also was placed in the meter to prevent rotation in the direction away from the fixed contact.

With the rotaries running at line voltage they are delivering energy to the line and the meters attempt to run forward but cannot as the stop prevents them. If the voltage of one of the rotaries drops below the line voltage there is a flow of energy back into the machine and the meter swings back closing its contacts and opening the circuit breaker by short circuiting the no-voltage coil. A series resistor in the no-voltage coil circuit prevents a dead short of the circuit through the contacts.

This arrangement has provided a most excellent type of direct-current time-limit reverse-current relay and according to reports never has failed to operate.

Connection Checks for Polyphase Watthour Meters—I

By D. T. Canfield, Instructor in Electrical Engineering, Purdue University, Lafayette, Ind.

INTRODUCTION

It is the purpose of this discussion to provide useful operating information on the subject of checking the connections of polyphase watthour meters. In this manual all theory as to why the checks operate has been omitted purposely.

The assembling of the material covered in such a brief form was deemed worth while because of the number of polyphase meters actually installed that have been found to be connected improperly. On any large public utility property improperly connected meters are reported frequently and it is by no means unreasonable to conclude that there are a great many such meters now in operation.

At the outset it may be well to emphasize the fact that no check subsequently applied is as valuable as correctness of connection in the original installation. At the time of the original installation the lines are usually dead and if all instrument transformers are first carefully checked and thoroughly marked and a standard method of connecting in the meter is adhered to the likelihood of making a mistake will be small. Furthermore, many of the checks to be described later and which could be applied at an original installation with comparative ease often are extremely difficult to apply at some subsequent time. Standardized methods of checking and marking all instrument transformers and meters is to be recommended highly.

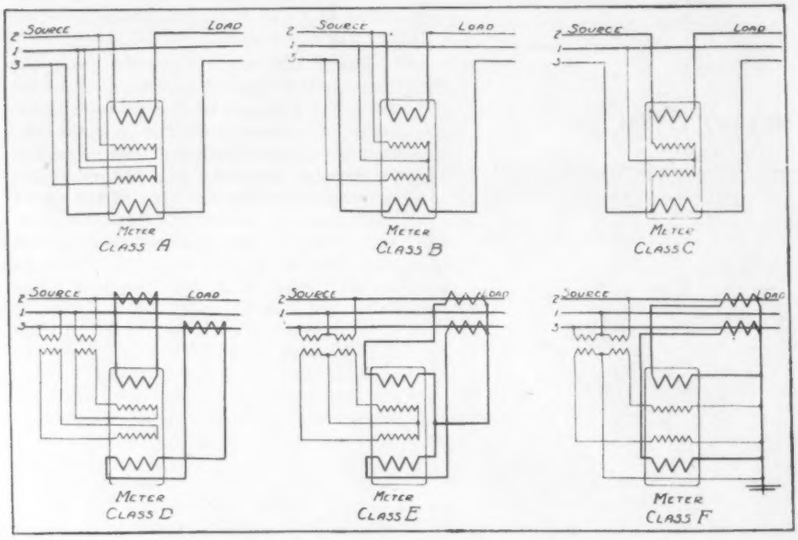


Fig. 1—Classification of Meter Connections.

The checks that follow are subdivided into four parts:

1. Special apparatus needed, if any.
2. Mechanical or physical operations in the order of their performance.
3. Simple and conclusive rules for interpreting the results of the operations in (2).
4. Advantages and disadvantages of the check.

Since some of the checks depend upon the number of leads brought to the meter it is necessary to classify meters according to their connections. The classification adopted here is given in Fig. 1. Thus a Class A meter refers to one used without instrument transformers where all leads are independently connected to the lines, etc.

CHECK NO. 1

Opening the Lines

Special Apparatus: None.
Procedure, steps in proper order:

1. See that the meter is running in the right direction with both elements connected.
2. Open that main-line wire which contains one of the current elements of the meter or current transformer, at a point on the line side ahead of all taps to the meter and also on the load side at a point behind all taps to the meter, A_1 and A_2, Fig. 2.
3. Note direction of rotation of disc.
4. Close the line at the points opened in Step 2.
5. Open the other line wire which furnishes current to the meter at two points, as in Step 2, B_1 and B_2, Fig. 2.
6. Note direction of rotation of disc.
7. Close the line at the points opened in Step 5.

Interpretation:

Rule 1. If the rotation in both Steps 3 and 6 is forward the meter is correctly connected.

Rule 2. If either Step 3 or Step 6 shows reversed rotation, either the current or the voltage coil of the element left in the circuit should be reversed.

Advantages:

1. The test is effective on any class of meter with or without balanced load, and at any power factor leading or lagging.
2. The leads do not have to be traced.

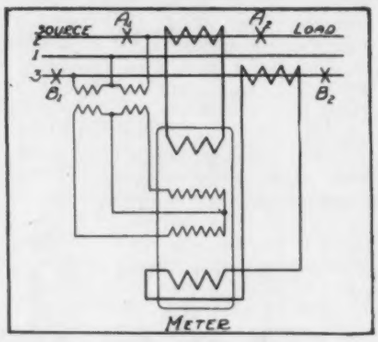


Fig. 2.—Illustration of Check No. 1.

Disadvantages:

1. Only rarely is it possible from a mechanical standpoint to open a main line in two places.
2. Even if it is possible from this standpoint to open the line, it often happens that it is impracticable to interrupt the load.

CHECK NO. 2

The Acherman Check

Special Apparatus: None.
Procedure, steps in proper order:

1. Be sure meter is either class B, E, or F.
2. Be sure the proper current and potential circuits are combined in the same meter element.
3. So connect the current leads to their respective meter coils as to obtain forward rotation for the meter as a whole.
4. Be sure that the load is not badly unbalanced. The difference between the largest and the smallest line currents should not be more than 25 per cent of the smallest.
5. Open the common voltage lead (P_2 Fig. 3), but leave the two meter potential coils strapped together as shown in Fig. 3.
6. Note direction of rotation.
7. Replace the common potential lead P_2.

Interpretation:

Rule 1. If Step 6 gives forward rotation the meter is correctly connected.

Rule 2. If Step 6 gives backward rotation the meter is improperly connected.

Rule 3. To correct the connections reopen the common potential lead P_2 and reverse that current coil that will give forward rotation and then replace the common potential lead P_2.

Rule 4. If now the lightly loaded

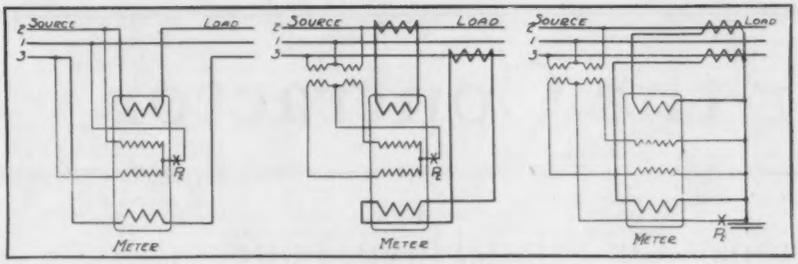


Fig. 3.—Illustration of Check No. 2.

element by itself rotates backward the power factor is less than 50 per cent, and if it rotates forward it is greater than 50 per cent.

Advantages:

1. No special apparatus is required.
2. Exact load balance is not required.
3. Knowledge of the power factor is not required.

Disadvantages:

1. The lead must be traced.
2. The check is limited to certain classes of connections.

Editor's Note.—This is the first of a series of four articles taken from Bulletin No. 8 of Purdue University Engineering Extension Service. The second will appear in a subsequent issue and will cover the Brown check, the Kouwenhoven check and a check for Class C meters.

Cheap Line Construction Used in Sparse Rural District

Among the many off-standard power lines designed by ingenious operators to keep down investment costs, perhaps one of the most original is that illustrated in the accompanying photographs. This "X-pole" construction was developed and put in practice by S. D. Young of Sherwood, Ore., who last year built eight miles of such line to serve about forty rural customers in the vicinity of Stafford, Ore.

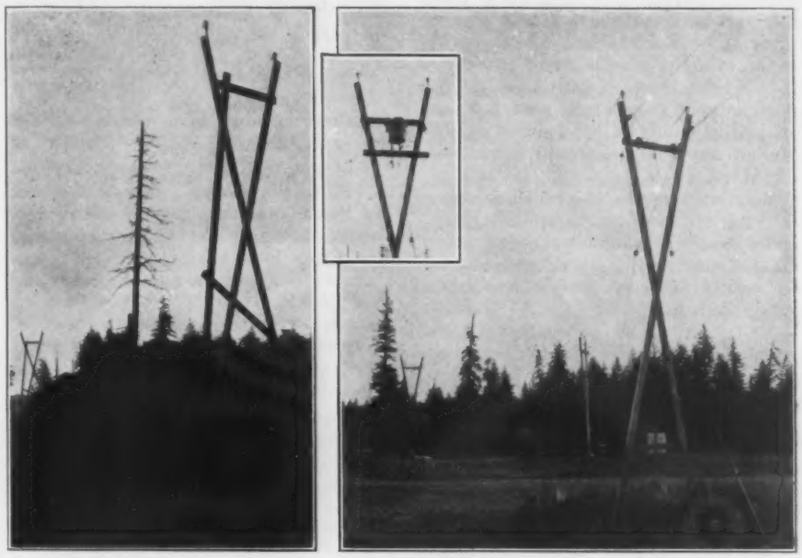
The idea for such construction was derived some years ago when Mr. Young noticed a number of pike poles supporting a round cedar pole during erection. The thought occurred to him that, if the pike poles were sufficient support for the line pole, the latter might be omitted entirely and the pike poles or their equivalent used as supports for the conductors. After experimenting with this idea for some time a short section of 2.2-kv. line was built some five years ago. Experience gained in constructing and operating this short line gave the owner confidence in this type of construction considering the conditions of cost and operation to be met. Subsequently this new and longer line was built using the design perfected in the earlier experiment.

The upright members are 20-ft. 2x4-in. fir lumber bolted together in such a way as to form an "X." A short 2x4-in. piece set crosswise near the top serves as a crossarm. Each leg is bolted to an iron pipe embedded in a concrete block which is set some 18 in. into the ground. These concrete bases weigh about 150 lb. each and provide the necessary protection against ground rot or termite attack. The block is reinforced by means of wire rings at the top and bottom of each block and by a few other pieces of steel placed at various angles. The X-pole thus are firmly braced crosswise to the line, but possess little or no rigidity longitudinally along the line except as provided by the conductors. Guys are placed on every eighth or tenth pole, or approximately every 1,500 ft., to strengthen the line longitudinally. Conductor sizes range from No. 6 to No. 10 B&S gage hard-drawn bare copper, depending on the load, and are spaced 2½ to 3½ ft. apart and from 16 to 18 ft. above the ground.

The problem of corner construction was solved by placing a vertical brace along the X-pole on the outside of the curve and adding a third footing. Sidehill problems also were easy as it was necessary only to shorten one leg of the X-pole to fit the contour of the ground at the pole site. Transformer and dead-end poles were constructed of 3x4-in. fir to provide additional strength.

According to the builder two men and a Ford roadster erected an average of four X-poles per hour. Conductors were stretched along the line by means of block and tackle and tied on the insulators before the structures were raised. Dead-end, corner, 3-legged sidehill and transformer poles were the only ones requiring climbing, and as a ladder was used for this no linemen's equipment nor services were required. Transformer poles were guyed longitudinally in both directions for rigidity. Spaces were 165 ft. or less, depending upon conditions.

The complete cost of a pole line using this type of construction and strung with two No. 8 B&S gage hard-drawn copper wires with glass insulators is approximately $350 per mile. The cost of each X-pole complete with base is about $3.50, the base costing about $1.25 for each concrete block delivered and placed, and X-poles costing approximately $1 each. The cost of corner X-poles and X-poles with guys is more than $3.50 each due to extra material needed such as extra base block, 2x4-in. braces, and ¼-in. guys with anchors. Mr. Young has convinced himself that this type of construction is very economical due to low first cost and low maintenance cost. Mr. Young states that even if the wooden uprights of the X-pole have to be replaced even every five years the cost of replacement will have justified itself as the first cost of these wooden members is only about 75 cents.



A rural 2.2-kv. line in service in a rural district near Portland, Ore. Left, angle construction; right, straight-away with branch line tap; insert, distribution transformer mounting method.

"Say It with Safety and Save the Flowers"

"Say it with safety and save the flowers";
A mighty good slogan for this company of ours.
Good for the ones who work with us;
Good for the soul of a careless cuss.
It's good for you and it's good for me,
A jim-dandy crack of a fine idee.

"Say it with safety and save the flowers;"
Good for employees as well as the powers;
Good for the speeder who goes whizzing by,
With a sneerful snort and a hell-bound cry;
Good for this careless-made sad world of ours—
"Say it with safety and save the flowers."

—Synchronizer

Ideas for the Contractor

Specifications—Or What Have You?

High Guesswork Factor in Architects' Specifications Would Be Eliminated by Electrical Specification Guide Prepared by Electragist Estimators

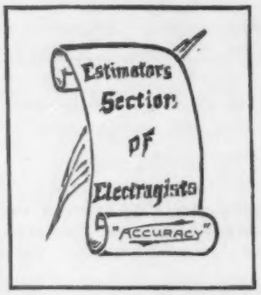
JUST why bids on any given wiring job should vary all the way from sky high to several feet below sea level has always been one of the great mysteries of the age. Everyone has his own private guess as to just where the rose should be pinned. But it is safe to say that a great majority of guesses will find themselves pinned to one factor in bidding—the specifications.

At least, thought the Estimators' Section of the California Electragists, Southern Division, if the basis from which all legitimate and honest bidding starts—the specifications themselves—can be brought to a point of completeness and detail which will eliminate the wide range of guesswork, one less cause for this mysterious divergence of figures on any given job will have been eliminated.

The specifications, the real beginning place of all electrical estimating, became therefore a logical starting point for the constructive work planned by that group of estimators which meets every Thursday noon in Los Angeles. Its first year's work as an Estimators' Section found itself spent in that most necessary task of breaking down suspicion and rivalry between competing estimators. When the fundamental principle had been learned that no matter by what method a contracting establishment did its estimating, economic laws cannot be violated without financial suicide, and the simplicity and completeness of the Electragist system of estimating had been proved, the Estimators' Section felt that it would best justify its existence in the accomplishment of a group work which should benefit the entire industry.

The result of this thinking and, more important still, doing, is to be seen in the following guide to the writing of adequate specifications which that section has prepared. The guide is intended to be distributed to architects and engineers and an effort will be made to secure their co-operation in writing electrical specifications under its direction.

The guide is altogether one asking for complete detail—nothing else. No material is specified nor is any attempt made to influence the architect to do anything except BE DEFINITE. If electrical specifications are made definite enough and complete enough in detail, any estimator knows, there cannot be much variance in prices bid on the job—providing the bidding is honest.



The emblem recently adopted by the Estimators' Section, California Electragists, Southern Division.

The architect, on the other hand, used to telling his stenographer to dig out the specification written ten years ago, change the name and address and send it out for bids on the new job he is planning, will have a reliable guide and an up-to-date one to follow in asking for just what he wants in the way of electrical installation. A world of argument and misunderstanding may be eliminated in this simple fashion.

The booklet, of letter size, and labeled with the file number "A-I-A File No. 31-A," of the American Institute of Architects, intended for the architect's files for ready reference, starts out with this modest declaration of purpose:

The Estimators' Section of the California Electragists

Southern Division

Submits this Guide with the hope that it will be of use in writing Electrical Specifications

Without further word it jumps right into the specification itself, under the heading:

GENERAL CONDITIONS

Scope of the Work

The work to be done consists in providing all materials, appliances, equipment, tools, labor, etc., unless otherwise stipulated, necessary to erect a certain electrical system in the Owner's premises at.....
in accordance with the following specifications and accompanying drawings.

Definition

The term Owner, when used herein, shall mean .....
of the party of the first part. The term Architect, when used herein, shall mean.....
.....or his representative.

The term Contractor, when used herein, shall mean .....
.....party of the second part.

The Contract

The agreement, and general conditions of the Contract, the specifications and the drawings form the Contract, and they are hereinafter called Contract Documents. They shall be signed in duplicate by the Owner and the Contractor. Neither party shall assign the Contract without the written consent of the other.

Intent of Documents

The Contract Documents are complimentary and what is called for in one shall be as binding as if called for by all.

The Documents are intended to include all the details of labor and material reasonably necessary for the proper execution of the work. If material or workmanship are described in words which so applied have a technical or trade meaning, they shall be held to refer to recognized technical or trade standards.

Bids

The Owner shall not be bound to accept any of the bids submitted nor incur any liability for the preparation of bids. No claims shall be made for the alleged lack of information after bids are accepted.

All drawings and specifications shall be returned to the Architect when the bids are submitted.

Drawings and Specifications

The Contractor shall carefully study and compare this specification and the drawings, as they will be enforced in every detail, unless cancelled in writing before Contract is signed.

The Architect shall furnish, by means of drawings or otherwise, additional instructions necessary for the proper execution of the work. All such instructions shall be consistent with the Contract Documents and the work shall be executed in conformity therewith.

The Contractor shall at once report to the Architect any error, inconsistency or omission which he may discover.

The Architect shall furnish the Contractor, free of cost, two copies of the specifications, and three of each drawing. Additional copies may be obtained at the cost of reproduction.

The Contractor shall submit to the Architect two copies of all shop drawings and schedules required for the work.

The Architect's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings, or specifications, unless he has called to the Architect's attention in writing such deviation and filed with said drawing a copy of the said letter.

The Contractor shall keep one copy of all drawings and specifications on the work in good order, available to the Architect and to his representative.

Permits and Inspections

The Contractor shall obtain permits at his own expense to comply with the rules of the National Board of Fire Underwriters, the State Industrial Accident Commission, and the local City Ordinance, anything on the drawings in the specifications to the contrary, notwithstanding. In case the Contractor shall violate any ordinance or rule, he shall immediately correct the installation, and he shall be held resopnsible for any and all damage and expense arising therefrom.

Failure or Delays

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the Owner, after three days' written notice to the Contractor, may remedy such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor; provided, however, that the Architect shall approve both such action and the amount charged to the Contractor.

If the Contractor is delayed in the completion of the work by any acts or neglect of the Owner or the Architect, or of any employee of either, or by any other Contractor employed by the Owner, or by changes ordered in the work, or by strikes, lockouts or other causes reasonably beyond the Contractor's control, or by fire or other unavoidable casualties, or by delay authorized by the Architect pending arbitration, or by any other cause which the Architect shall decide to justify the delay, then the time of completion shall be extended for such time as the Architect decides to be reasonable.

No such extension shall be made for delay occurring more than three days before claim therefor is made in writing to the Architect. In case of a continuing cause of delay, only one claim is necessary.

Insurance

The Contractor shall maintain Workmen's Compensation and Public Liability Insurance.

The Owner shall effect and maintain Fire Insurance upon the entire structure on which the work of this Contract is to be done, and upon all materials, tools, and appliances in or adjacent thereto, and intended for use thereon, to at least 80 per cent of the value thereof. The loss, if any, is to be made adjustable with and payable to the Owner as Trustee for whom it may concern.

Bond

(Here specify the bond to be required, if any.)

.....

Payments

(Specify how payments are to be made.).....

.....

Arbitration

Should any question arise during the progress of the work, at the acceptance, or regarding settlement, such questions shall be referred to the Architect for decision. Should either party feel aggrieved at such decision, said party may appeal to two disinterested persons, one chosen by each party to this agreement, and in the event of the parties so chosen failing to agree, they are to choose a third, the decision of two of said referees to be final and binding on both parties.

Such determination shall be a condition precedent to any right of action. If no such appeal is taken within thirty days, the decision of the Architect shall be conclusive.

Supervision

The Contractor shall give efficient supervision to the work, using his best skill and attention. He shall, at all times during construction, keep a competent foreman on the work. The foreman shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor. On written request such directions shall be confirmed in writing to the Contractor.

Changes and Extras

Absolutely no changes in the work or substitution of other materials for those herein specified will be permitted, or extras allowed, except on written order from the Owner, approved by the Architect, and said order must state the amount to be added to, or deducted from, the contract price in consequence of such change.

Symbols

Standard Symbols for Wiring Plans as recommended and adopted by the Association of Electragists, International, The American Institute of Architects and the American Institute of Electrical Engineers, and approved by the American Engineering Standards Committee on March 6, 1924, shall be used.

SPECIFICATION FORM

Location of Building

(A) Street number and between what streets.

(B) Furnish plot plan showing location of light company and telephone company poles or manholes.

Type of Construction

1. Class "A." All fireproof, no bearing walls, all loads carried on columns.
   1. Walls—type of construction: Brick, hollow tile, concrete, with or without inside furring.
   2. Floors—type of construction: Solid slab or pans. Give thickness of slabs.
   3. Partitions—type of construction: Hollow tile, solid plaster, gypsum blocks, metal studs.
   4. Ceilings—type of construction: Hung, give distance below slabs or joists.
2. Class "B." Masonry load bearing walls. All fireproof walls, floors, and partitions.

Note: Same specific reference to type of construction for walls, floors, partitions, and ceilings as for Class "A."

3. Class "C." Masonry walls, wood floors and partitions.
   1. Walls—type of construction: Brick, concrete, or hollow tile, with or without furring.
   2. Ceilings—type of construction: Furred down or lathed direct on joists.
4. Class "D." All types of construction other than included in Classes "A," "B," and "C" above.

Work Included

Under these specifications and the accompanying drawings, the Contractor shall furnish all labor, and furnish and install all material for the following electrical work:

(A) Electric light wiring complete but without fixtures except as noted in these specifications.

(B) Electric power wiring as noted on drawings and specifications.

(C) Other miscellaneous systems as specified further in these specifications.

Work Not Included

Fixtures, lamps, motors, motor starters, motor controls, unless otherwise specified.

Materials

Under these specifications all materials used shall be approved and listed by the Underwriters Laboratories of the National Board of Fire Underwriters.

Conduit

Specify manufacturers' makes as desired.

Wire

Specify manufacturers' makes as desired.

Outlet Boxes

Specify manufacturers' makes and types as desired.

Switches

Furnish and install where shown on plans. Give height from floor and specify makes and types as desired.

Convenience Outlets

Furnish and install where shown on plans. Specify makes and types as desired.

Plates

Specify finish and manufacturers' makes as desired.

Special Outlets

Specify—if any, such as ranges, heaters, signs, and all other heavy duty appliance outlets.

Floor Boxes

Specify manufacturers' makes as desired, also whether adjustable or non-adjustable.

Pull and Anchor Boxes

Give locations and number to be installed.

Panel Boards

(A) Panel boards are to be installed where shown on plans.

(A-1) Give size and number of circuits.

(B) State whether panel boards are to have circuit switches or fuses only. Whether they are to have single doors or double doors. Whether the cabinets are to be surface or flush type. Specify manufacturers' makes as desired.

Main Switchboard

(A) Give schedule of requirements and location, stating the voltage and type of service, number and size of switches, or circuit breakers, for the light, heat and power panels and the emergency circuit and also state whether metered or sub-metered. Specify manufacturers' makes and types as desired.

Service

(B) Give location of sub-meters if located other than on main board.

Specify size of conduit, number and size of wires, and location of service.

Sub-Feeds

Specify size of conduit, number and size of wires, and arrangement of all sub-feeders.

Sub-Feeds to Special Outlets

Give size of conduit, number and size of wires.

Underground

State type of construction whether rigid metal conduit or fibreduct encased in concrete.

State whether wire is to be double braid rubber-covered or lead-sheathed.

Fuses

State manufacturers' makes as desired, whether renewable or non-renewable.

Power Wiring

Give motor size, conduit size and wire size, together with location and number. State whether to install and connect motors and starters.

Telephones

Public: It is very important and necessary that the Architect incorporate in these specifications and in the building plans detailed provisions for a complete telephone distribution system of conduits and raceways that meet the requirements of the telephone company.

Since the problems presented are many and varied and different for each building, it is essential that the plant engineer of the telephone company be consulted in each case.

Private: Specify manufacturers' make and system. Number of phones, whether surface or flush.

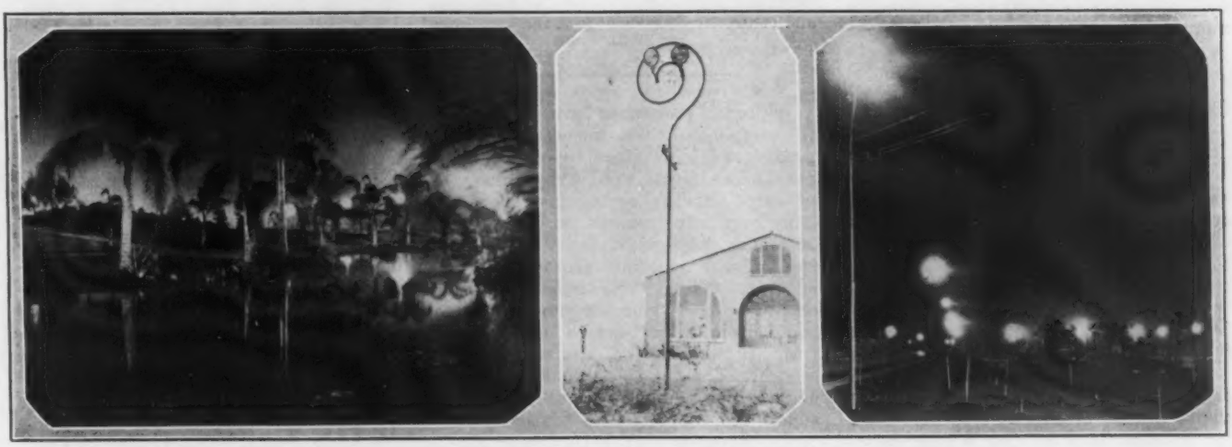
Other Special Systems

Ventilation, clocks, bells, annunciators, fire alarms, silent call systems, radio, etc.

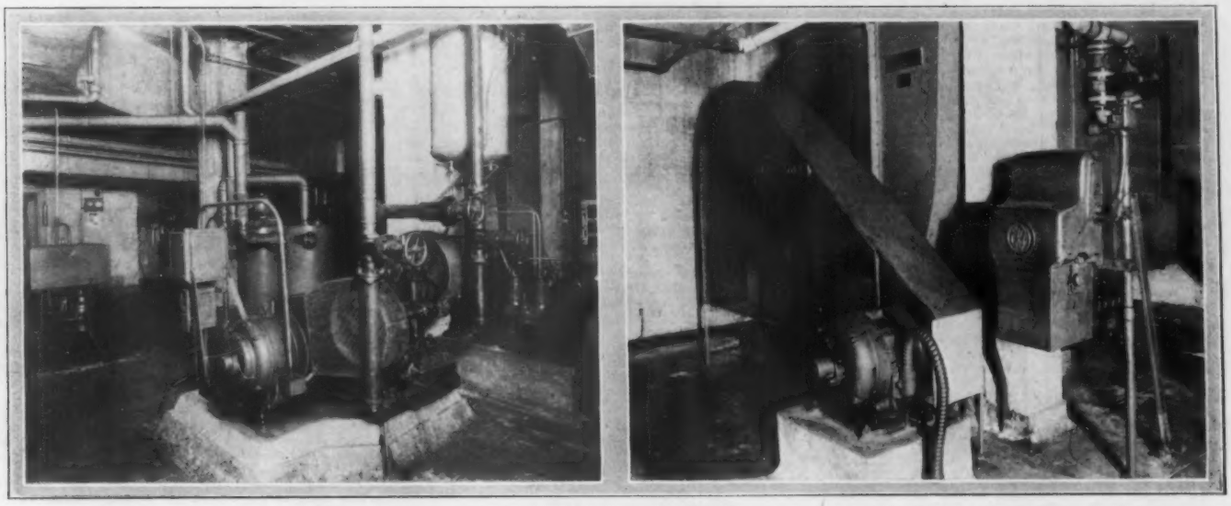
Guarantee

The specification guide is followed by a number of advertisements of manufacturers of electrical apparatus. The Estimators' Section has offered to supply copies to any electrical contractor or architect requesting it.

Park Floodlighting from Units Mounted on High Standards



Two views of the municipal park of the city of Montebello taken at night with the aid of light furnished by a flood lighting system recently installed by H. L. White, Los Angeles factory representative for the Crouse-Hinds Company. Twenty-one standards, each carrying two 500-watt units were installed. The standards were designed by the illuminating engineering department of the Southern California Edison Company. The center picture, taken in daylight, shows one of the standards in detail.



Motor equipment for pumps for water pressure system and at right, for fans used in building's air circulation systems.

Complete Motor Equipment in Salt Lake Bank Building

Air Washed and Cooled by Particularly Complete Ventilating System. Heating and Water Distribution System Also Well Planned

UNUSUALLY complete ventilating, cooling and heating systems are installed in the recently completed Continental National Bank Building in Salt Lake City. The equipment is designed not only to circulate air throughout the building but also to either cool it or heat it and to wash it during the process.

As laid out by C. M. Parshall, consulting engineer, the main banking room ventilation is taken care of by a size 11 fan driven by a 3-phase, 220-volt, 1,160-r.p.m., 10-hp. motor. A size 10 exhaust fan to remove air from the building is driven by a 3-phase, 220-volt, 1,160-r.p.m., 5-hp. motor. The other fan equipment, consisting of a size 7 fan to ventilate the boiler room is driven by a 3-hp. motor, 220-volt, 1,160-r.p.m., and a No. 6½ fan to ventilate the lavatories, which is operated by a 3-hp., 3-phase, 220-volt, 1,160-r.p.m. motor.

For the air cooling apparatus in which the air is also washed, further motor equipment is utilized. The air cooler pump is driven by a 7½-hp., 3-phase, 220-volt, 1,750-r.p.m. motor.

Pipe rack panel fabricated to support starter and controller equipment for bank building's pumps.

The heating is regulated throughout the building on a Johnson service system by the use of two 1½-hp., 3-phase, 220-volt, 1,735-r.p.m. motors connected to pumps.

Water pressure throughout the building is maintained by a 7½-hp. motor-driven pump. This supplies water under pressure to all floors including the fourteenth.

The other electrical equipment in the building includes an elevator system, telephone and lighting systems. Motor equipment is all handled through controllers and starters. The switchboard was designed and made by the Capital Electric Company of Salt Lake City. The electrical installation was made by the Salt Lake Supply Company, electrical contractors. C. M. Parshall, consulting engineer for the building, states that the entire plant has given satisfaction in every detail.

Clubrooms for Employees Prove Good Investment

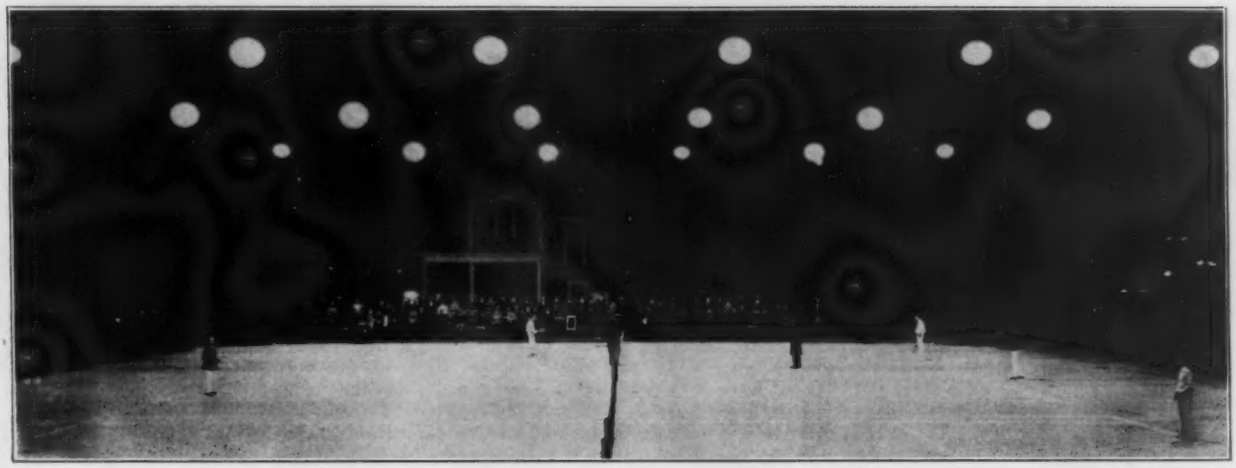
H. H. Walker, Electragist, widely known electrical contractor and retail dealer for electrical appliances, has what is probably one of the few fully equipped clubrooms in the West for employees of an electrical contractor.

The clubrooms, located on the third floor of the Walker building on Venice Boulevard, Los Angeles, Calif., are completely outfitted with a pool table, punching bags, boxing gloves, Indian clubs, chairs, etc. The clubrooms are the headquarters for the Walker baseball team and bowling team, each of which takes a prominent part in city leagues.

While the rooms are furnished free to the employees, the miscellaneous expenses are maintained by membership dues, according to Fred Ayres, manager of sales for the company. The company regularly employs between 75 and 100 men. The employees working outside of the building are assessed 50 cents monthly, while inside workers, office and retail store employees, due to the fact that they derive more benefit from the clubrooms, are charged $1 monthly. The money is placed in charge of the office manager of the firm, who supervises the activities of the club.

Mr. Ayres is very enthusiastic about the club and considers that it has its effect in keeping down labor turnover and makes for satisfaction among the workers, giving many of them relaxation and an interest in sport they might not get otherwise.

Municipal Fire Alarm Systems.—Regulations of the National Board of Underwriters for the installation, maintenance and use of municipal fire alarm systems as recommended by the National Fire Protection Association and approved by the International Association of Municipal Electricians was recently reissued in a 1926 edition. As the name implies, the phamplet deals with the rules and regulations governing installation and maintenance of this type of system.



Future Western net stars may train in the cool of evening on lighted courts like these.

Night Lighting for Outdoor Sports

Extracts from Recent Bulletin as Applicable to Western Outdoor Sports Conditions During Spring and Summer Months—Tennis Courts

By O. F. Hass and H. M. Sharp, National Lamp Works of General Electric Company, Nela Park

OUTDOOR sports are as old as the history of man. The recreational facilities of schools, colleges, clubs, municipal parks and playgrounds mean health and wholesome enjoyment for those of leisure hours, but many, in all walks of life, are forced to forego these pleasures because of the lack of daytime leisure.

Night lighting releases from the bonds of time millions of people who cannot now participate in sports during daylight hours. Midsummer evenings offer but a few hours of daylight after the working day and at these times the facilities are taxed to the limit. These hours can be doubled or tripled by night lighting, and the playing days extended until late autumn.

More and more attention is being paid to sports. For those who work during the day there are movements afoot in almost every community to provide playgrounds which may be used at night. Adequate and well spread lighting is as important to such night time play as the playground itself. There have been extracted for publication here in brief form some of the more important considerations for the planning and installation of good playground illumination.

The Lighting Problem

Outdoor sports lighting, though still a novelty in some respects, has passed the experimental stage and has an established position among real practical applications of the art of illumination.

Outdoor lighting for activities of a recreational nature may be divided into two classes: (1) the lighting of standard courts and (2) the lighting of large fields (each class of which presents a different aspect of the lighting problem).

On standard courts, while the illumination requirements in many cases may be severe, the activities are confined within definite limits, so that the engineer or contractor can at once choose the proper lighting equipment, and designate the locations for this equipment which will give a satisfactory distribution of light, and not interfere with the playing. Tennis, volley ball, roque, and horseshoe pitching courts are examples of definitely bounded playing areas.

In the lighting of large fields, or areas on which activities are not confined within definite bounds, the problem becomes more difficult and oftentimes is peculiar to each individual project. The lighting of fields for football and track meets, and the lighting of municipal parks, playgrounds and bathing beaches fall in this category. It is first necessary to determine the degree of illumination needed to carry on the particular form of recreation for which the lighting is provided. At the same time, it is important to determine whether or not the illumination is required on some particular plane or whether the plane, itself, is variable. If such is the case, it is necessary, of course, to light not only the field but to provide illumination in upper angles sufficient to follow the course of the ball through the air with a degree of certainty that assures swift and accurate judgment on the part of the participants and spectators.

The problem of lighting for outdoor sports clearly resolves itself into one of so choosing and locating the lighting units that ample illumination is obtained at the place or places where it is needed, with the minimum of shadows and spottiness on the playing area. At the same time the supporting standards must be located well out of the way of the players and so arranged that glar-

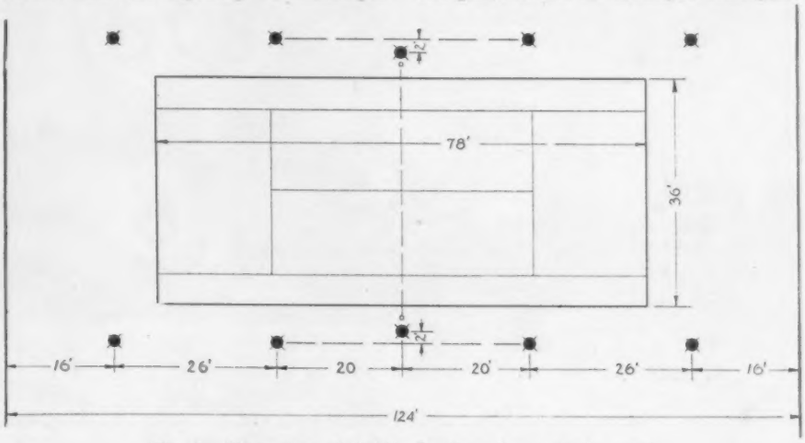


Fig. 1. Plan view of lighting system for a single court.

ing light sources do not defeat the purpose of the installation.

The Lighting Equipment

The choice of suitable equipment for outdoor lighting depends upon the characteristics of the lighting fixture and how well it meets the requirements of any particular application. There are four types of lighting equipment generally used for outdoor lighting.

RLM Standard Dome Reflector.—This reflector is widely used for industrial lighting, and is recommended for many outdoor applications because of its high efficiency and design to give a favorable distribution of light downward at useful angles. It is made of enameled steel, is durable and rugged. This type of reflector is recommended in most cases for overhead lighting of areas, where the reflectors can be mounted on poles or suspended from cables at frequent intervals. RLM reflectors give a high degree of illumination on horizontal surfaces. White bowl lamps should be used with the RLM reflectors so as to prevent excessive glare from the bright lamp filaments.

Deep Bowl Reflectors are particularly recommended for lighting tennis courts. The large shielding angle effectively conceals the brilliant lamp filament from the direct view of the players who, by necessity, must frequently look upward toward the units. The distribution of light is such that these units do not have the general applications of the Standard RLM reflectors.

Angle Reflectors naturally suggest themselves when the problem is one of lighting a small playing area with units along the sides. These units direct the light efficiently to such an area, but where the nature of play requires vision at upper angles it is impossible to avoid the blinding rays of the units. Consequently their application is limited. For certain sports, such as hockey, where the play is carried on close to the ground, angle reflectors are applicable when mounted well above the angle of vision.

Floodlights.—All large areas, such as football fields, bathing beaches, trap shooting ranges, and the like, require floodlights to meet the severe and variable conditions. For such applications, obviously, other types of equipment cannot be used because of the wide angles through which the light must be directed. The fact that these areas, in general, must be free from obstructions necessitates projecting light from a distance. Floodlights are made in various sizes and have different characteristics as regards beam spread. Usually, a wide beam projector is best adapted to meet these requirements.

Location of Lighting Equipment

The success of any lighting system involves many factors, such as adequate illumination, efficiency, general appearance, and lack of glare, shadows and spottiness, but, in the final analysis, all of these are regulated largely by just two things, namely, the lighting equipment (reflector and lamp), and the location of this equipment.

Having determined the type of reflector to be used the proper location and number of fixtures become of signal importance.

It should be remembered that each type of lighting equipment gives a certain characteristic distribution of light and for this reason can be depended upon to light only a definite portion of the territory. When the fixtures are too far apart the lighting will be uneven, and shadows will be pronounced. The higher the fixtures are mounted the fewer will be required, although larger lamps must then be used.

Fig. 2. Skirts fastened on the outside rows of reflectors increase the amount of light on the court.

In floodlighting the locations of the lighting groups are chosen to give uniformity of distribution and to avoid glare and long, sweeping shadows.

The recommendations given herein for lighting the different outdoor recreational grounds will provide sufficient light for the full enjoyment of the sport. Any modifications which suggest themselves should be made only with the knowledge and understanding of the influence of all the various factors upon the success of the lighting system.

Tennis Court Lighting

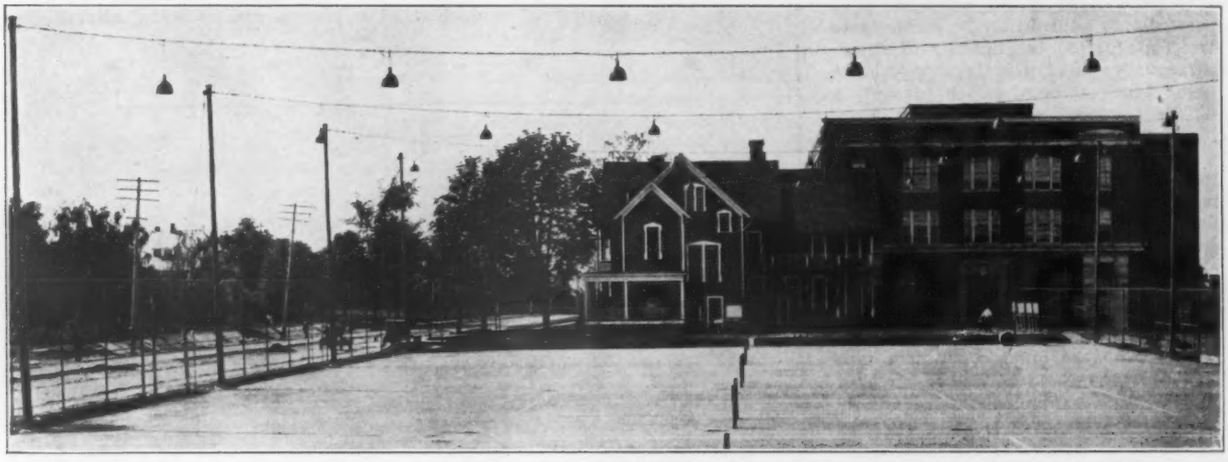
The lighting of tennis courts embodies several features which are necessary to meet the rather severe requirements of this particular sport. The execution of any tennis shot depends upon the ability of the player to judge accurately and quickly both the velocity and position of the ball at all times. Distracting images or shadows would, of course, prove to be a considerable handicap to a player who is in rapid motion and whose attention is closely concentrated on a swiftly moving ball. It is at once evident then that the illumination must be such as to facilitate rapid and accurate vision. So it is important that a high level of illumination be provided. One must be able to follow the course of the ball equally well at all levels, from the ground to a considerable distance in the air. Throughout this entire lighted space it is also necessary that light be evenly distributed, since spottiness or unevenness in the illumination would render accurate judgment extremely difficult, due to the fact that an apparent change in speed is noticed when an object passes from a light area into a dark space or vice versa. Just as in any other lighting installation, glare must be carefully avoided or the entire purpose of the installation will be defeated.

Aside from the illumination requirements, every installation should be carefully planned so that all obstructions are well out of the way of the players. This necessitates the placing of the supporting poles far enough from the outside lines to permit freedom of over-boundary playing.

Since tennis is so universally played, the advantages of night playing are perhaps greater and the benefits are more far-reaching for this than for any other single sport. For this reason and because of the large number of details involved, complete specifications for lighting are given.

Recommendations

The plan for the lighting of single tennis courts is shown in Fig. 1. Five 1,500-watt clear Mazda lamps mounted 30 ft. above the ground should be used on each side of the court, each lamp equipped with a deep bowl aluminum reflector and skirt, as shown in Fig. 2.



Daylight view of court shown on preceding page, showing suspension of units.

This system will provide a level of illumination entirely sufficient to enable a high class of tennis to be played. There are a limited number of courts on which championship matches are played. Here it is recommended that 2,500-watt lamps be used during the matches and if desired during the practice periods. The larger lamps may be substituted for the 1,500-watt size without any change in equipment provided the system is designed with sufficient capacity.

In choosing a method of supporting the lighting units, a minimum first cost combined with easy maintenance are, of course, the principal factors to be considered. A system using rigid bracket arms mounted on poles will adequately meet these requirements. The rigid bracket arms allow the use of disconnecting hangers, thus simplifying cleaning operations, lamp replacements and removal of equipment for storage during the winter months. The rigid support for the reflectors also prevents the units from swinging and rotating in the wind and thus eliminates the glare and uneven illumination which might otherwise obtain. A list of the material necessary for the construction of this system is given in Table I.

The current supply for the lamps may be either by underground or overhead wiring, depending upon local conditions. Where more than one adjacent court is to be lighted, each row of lighting units should be controlled separately by means of a switch placed conveniently on one of the poles so that units not needed may be turned off.

In some instances the units have been supported by means of a steel cable stretched between poles, two or three poles per string of units being used, as shown in accompanying illustrations. To prevent the reflectors from swaying in the wind, it is necessary to stretch a small wire between the poles and attach it to the rim of each reflector. Obviously, a disconnecting hanger cannot be used, so that the maintenance of such a system is not as easy as in the case of the one recommended above.

Material Necessary for One Row of Units

Poles
- 3 45′ wooden poles set 6′ in the ground.

Bracket Arms
- 2 16′ bracket arms.
- 2 20′ bracket arms.
- 1 2′ bracket arm. This item is to be omitted in row between adjacent courts. (On the row of units between courts the two center reflectors are attached to the 20′ bracket.)

Lighting Units
- 5 1,500-watt or 2,500-watt Mazda C lamps. (Six required for a row of units between courts.)
- 5 Deep bowl spun aluminum reflectors, such as the Ivanhoe No. 865. (Six required for a row between courts.)
- 5 Aluminum reflecting skirts, such as the Ivanhoe No. 867. (Omit this item when ordering for a row between courts.)

Accessories
- 5 Disconnecting hangers, such as the Thompson No. 94-A. (Six required for a row between courts.)
- 5 Pulleys. (Six required for a row between courts.)
- 215′ Steel chain and fittings. Add 60′ for a row between courts.
- 1 100-amp. switch.

Lumber Dry Kilns Use Electric Heat

Door Lumber Dried Without Checking in Forty-eight Hours at Cost to Compare with Oil

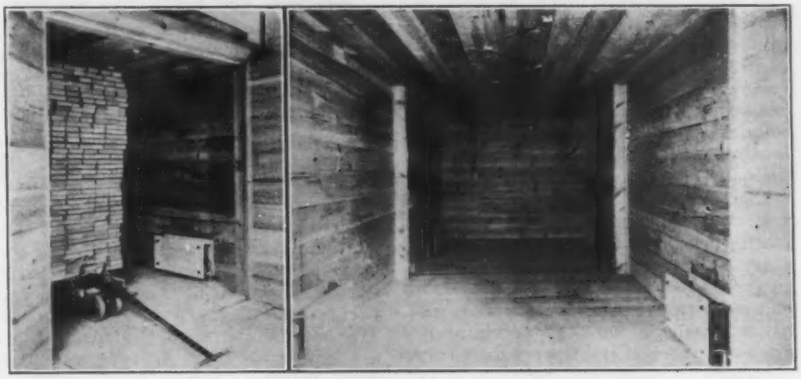
ONE of the most interesting recent applications of electric heat has been one of lumber drying in a lumber mill. Because of its nation-wide possibilities as a load builder it has attracted considerable attention. The installation was made at the plant of the Chicago Lumber Company, Oakland, Calif.

The drying box has dimensions approximately 10 ft. wide by 7 ft. high and 21 ft. long. The compartment is constructed of ship-lap, backed by moisture-proof paper and insulated with packed shavings. The lumber to be dried is principally in short lengths, used after drying for making up window and door casings. Removal of moisture is calculated to be equivalent to 5 per cent of the weight of the dry lumber. This drying is accomplished within 48 hours' time without end-checking or otherwise damaging the lumber.

Compares with Oil in Cost

The calculated cost of operation was estimated at 100 kw-hr. per 1,000 board ft. of lumber. Actual operation has given an economy much better than this. The cost of power is estimated at 1.15 cents per kw-hr. which competes favorably with oil at $1.25 per bbl. of 42 gal.

Electrical equipment consists of 15 kw. on heating elements. This load is obtained by using four of the G.E. form G oven heaters. The temperature is automatically controlled at 90 deg. at the beginning of the drying cycle and at 120 deg. F. near the end of the period by means of an automatic control panel and a Bristol temperature control. Four



Interiors of dry kiln; at left with load of lumber in place; right, showing location of heaters and sensitive bulb along ceiling.

With doors closed. Control apparatus located in recess on side wall and on building wall at extreme right.

openings in the floor where the cold air is drawn in by natural draft are provided. A heater is placed over each opening. There is an opening in the roof to allow the moisture-laden air to escape. This is so located that the air must pass over the lumber before it is ejected.

The temperature controller has a sensitive bulb 25 ft. long, which is spread out over the ceiling of the compartment so as to control the average temperature over the whole of the drying box. The lumber is run into the drying compartment on trucks and is so loaded as to give ample space around each piece to allow free air circulation. This installation has proved so satisfactory that a second identical installation has been made.

Electric Heat in Glue Room

The Chicago Lumber Company also has installed electric heat in a glue drying room which is 20 x60 by 12 ft. high. In this room there is a motor-driven machine on which window and door sash parts are glued together. It is necessary to keep the air in the room heated in order that the glue may be dried thoroughly by the time the sash has passed from one end of the machine to the other. The heating equipment consists of eight form G heaters mounted in a Sturtevant specially constructed blower, equipped with a 20-in.

motor-driven fan. The fan, motor and heater compartments are so assembled as to take up a space only 30 x 34½ in. by 27 in. high. This heat generator and blower is installed at one end of the room near the ceiling. The fan draws cold air over the heater, the heated air being blown directly towards the opposite end of the room, thus bringing the air in direct contact with the sashes passing through the machine. The temperature is controlled at 85 deg. F. by means of a thermostat and an automatic control panel. In the same room there is a glue cooker 31 in. long by 12 in. wide by 23 in. high equipped with two 3-kw. water immersion heaters. The glue is contained in five 5-gal. copper tanks. The temperature is controlled by means of a preheat switch.

All of the electrical wiring in the plant was handled under contract by the Pacific Electric Motor Company, Oakland.

Electric Heat as Utilized in Ovens and Welding Rigs

Various Types of Installations Described with Attention Called to Special Set-Up Features and Operating Conditions of Each

By J. R. WILSON*, Quality Electric Works, Los Angeles

Electrical Estimating Series XXIV

THE process of annealing is applied to steel and other metals, also to glass, porcelain, chinaware, etc. The annealing of steel is done usually in special heat treating furnaces because of the high temperature required in this process. In the manufacture of glass articles, such as chemical apparatus and other complex forms, careful annealing must be resorted to in order to relieve any stresses that may occur. In decorating china and glassware with colors the articles must be fired, or heated to a definite temperature, if the coloring is to remain permanent. The heating process fuses the coloring into the body of the article being treated.

Electric ovens are far superior to any other type of apparatus for annealing because of the uniform temperature and accurate control which can be maintained and duplicated at the will of the operator. The heating units can be arranged in such grouping as to gradually increase the temperature from minimum to maximum, maintain it for any desired length of time, then gradually reduce it to minimum again. This method is ideal for annealing, especially for delicate glass and china articles. Ovens designed to anneal glass articles are called Lehrs (also Leer) and are very efficient when electrically heated. They are built in the "continuous type" to sizes of 9 x 60 ft. with a connected load of 300 kw. Their operating cost is no higher than that of the best fuel types.

After the insulating varnish has been applied to armature, field, transformer and other types of coils, it is very desirable to dry the varnish rapidly at a definite temperature in order to prevent the absorption of moisture. To accomplish this quickly, successfully and with the least amount of trouble to the coil manufacturer, electric ovens are rapidly superseding the methods formerly used. Usually these ovens consist of a heat insulated compartment built of brick, concrete, or metal sheets with asbestos between them, and suitable conveying equipment to handle the product easily and rapidly. Hand trucks, equipped with special racks, hangers, or cradles are also largely used. Some of these ovens are designed to be tightly closed, and ultimately reach a very high degree of temperature.

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Equipped with Ventilating Systems

Others are equipped with ventilating systems to provide a constant circulation of the heated air. The speed at which the baking is done depends largely upon the amount of fresh air passing over the oven's contents. The current consumption depends upon the manner in which the fresh air is circulated through the oven, and the rate of heat absorption by the product. In heating large armatures, field and transformer coils, and other large articles, the ventilating system is an important part of the oven equipment. The heating units used in these ovens are largely of the grid type, although many makers get very good results by use of the coil and strip types of heating units.

For drying and impregnating processes, such as used in the manufacture of coils, cables, insulating pins, instrument base boards, and other similar electrical materials, the electric oven is supreme. The impregnation of these articles is a very interesting process. To be successful, the material to be impregnated must first be dried thoroughly. In some cases, use is made of the same type of oven just described to accomplish the drying; then the article is dipped in an impregnating compound. In other systems the ovens are so built that the work is dried in a partial vacuum and then the hot impregnating fluid is applied. As the vacuum is let down, pressure is applied, thus forcing the fluid into the pores of the material being treated. The pressure applied may, in some cases, be as high as 50 lb. per sq. in.

The field of enameling and japanning, especially in the automobile industry, has proved very fruitful to makers of electric ovens. The manufacturers of typewriters, metal furniture, and other sheet metal articles, also make large use of electric ovens of special design. The handling of the work is usually done by means of continuous or semi-continuous conveyors, equipped with hooks, pins, clamps, or other means of attaching the articles thereto. The use of the continuous type conveyor requires that the oven doors be kept open and to prevent the escape of the heated air use is made of "air seals" at the openings. An exhaust fan system is also sometimes used to maintain an "air balance" within the oven, and thus prevent the escape of the heated air.

In the handling of the smaller type of articles to be baked trays or trucks are sometimes used. This is rather an inefficient method, unless heat of low temperature is used. Owing to the fact that the doors must be opened (and the oven allowed to drop to almost room temperature) each time a tray or truck is removed, the high heat oven is not the best to use for these small articles unless a continuous type conveyor system is also installed. In the ovens used for japanning and enameling, the heating units usually are arranged along the walls. These units are so constructed that they may be piled one upon the other to obtain the number required for the heat desired. The construction usually consists of a frame made of two tie rods on which the ribbon wound units are mounted. These tie rods also serve as the current conductors to the heating units.

In the laboratories of flour mills small electric ovens are extensively used for baking samples of bread, made from the various grades of wheat flour manufactured. This method gives a constant check upon the product and enables the miller to correct faults that may develop in the quality of the flour.

New uses for electric ovens are constantly being developed in industry. Many manufacturers are adapting these ovens to their own processes of product finishing, and some very wonderful results are being obtained. In foundries for baking cores and molds, in jewelry factories, for baking varnish and enamel on small parts—like watch and clock dials, etc.—their adaptibilty seems unlimited. In enameling wire, which is a "continuous" process, a special type of oven is employed. A special type for melting compound is also used in storage battery work.

Sherardizing Ovens

Electric ovens used for sherardizing metal are also of special construction. They are usually of a rectangular form, made of metal with heat insulated walls. This "tank" rotates on a central shaft, which is bolted to the ends. Current collector rings are mounted on this shaft to connect to the heating elements. The parts to be sherardized are placed in the tank, the zinc dust shoveled into the tank, and the door bolted down. The current is then turned on and the tank rotated by means of a small electric motor.

Vulcanizing consists of heating rubber and sulphur to a few degrees above the melting point of sulphur when the two combine and form vulcanized rubber. The degree of vulcanizing is dependent upon three factors—the amount of sulphur used, the temperature, and the duration of the heating. Electric ovens have proved very successful in the vulcanizing process because of more accurate control, more constant temperature and more even distribution of the heat within the oven.

To obtain a wider knowledge of the construction and uses for electric ovens, the reader is advised to write to the following firms:

General Electric Company, Schenectady, N. Y.

General Engineering & Supply Company, New York, N. Y.

Harold E. Trent Company, Philadelphia, Pa.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Hevi-Duty Electric Company, Milwaukee, Wis.

Owen Equipment & Manufacturing Company, New Haven, Conn.

Thero Electric Instrument Company, Irvington, N. J.

Acme Electric Heating Company, Boston, Mass.

Electric Heating & Manufacturing Company, Seattle, Wash.

Sheeline Manufacturing Company, San Francisco, Calif.

Electric Welders

The joining of metals by means of the electric arc welding process is familiar to anyone who has ever paid a visit to a foundry, machine shop, etc. While there are a great many different types of arc welding outfits on the market the principle of the process is practically the same in each type. Differences in design of the electrical equipment used and the claims made for each design form the only variations. The direct current outfits usually consist of a motor-generator set, a dynamotor, or a balancer. By means of this equipment the source of supply is converted to the proper arc voltage and current to produce the desired results. A control panel is provided to regulate the amount of current delivered at the arc, this being varied to suit the type of work being done.

In the alternating current outfits the rotating equipment used in the direct current outfits is replaced by proper size of transformers to produce the desired arc voltage and current. Much use is made of these outfits in metal cutting operations and a great many are mounted on trucks and used as portable equipment. Many automatic electric arc welding outfits are now being placed upon the market. They are made in both stationary and portable types, and great claims are made for them in speed of production, economy in use of electrode materials, and quality of product.

Butt Welders

Butt welding machines have a very wide range of use in metal working industries. They are used in the manufacture of fence posts, iron frames, etc., and produce a weld that is usually unbreakable. The process of butt welding consists of clamping the pieces to be joined in two pairs of water-cooled metal jaws and then bringing the ends of the work into contact with each other. One set of jaws may be stationary and the other set movable, or both sets may be movable.

When the two pieces of the work come into contact the circuit is closed through the secondary of a transformer which is built into the machine. This transformer is so built that the secondary voltage is low while the maximum current value is very high. The closing of the circuit through the work results in a rush of current of high value and immediate fusion of the metals. This fusion produces a burr at the jointure of the metals, which may be removed later by grinding on an emery wheel. The value of the current is regulated by a tap switch connected to the sectional primary winding of the transformer.

Automatic chain welding machines are an interesting and highly specialized type of the butt welder class. In this process iron rods are fed into the machine, heated to the proper temperature and formed into shape by a series of cams and eccentrics; then the ends are brought together and welded. The whole process is entirely automatic, and the resulting product is of a very high quality.

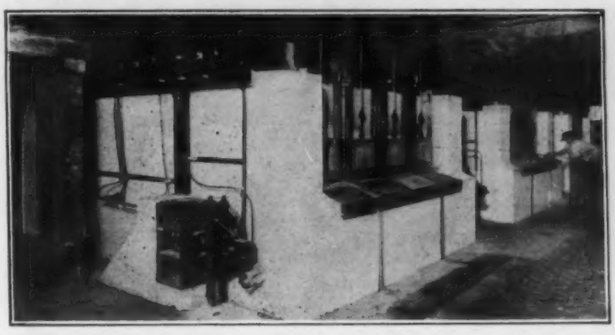
Spot Welders

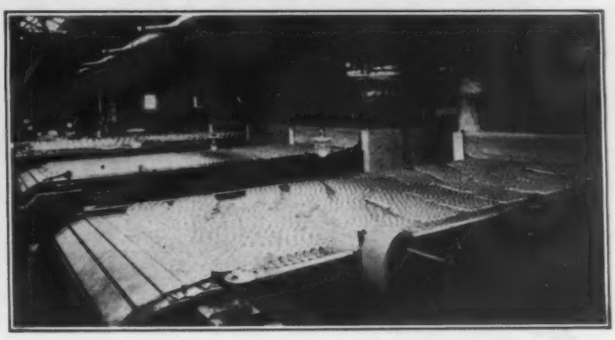
Spot welders are another type of extensively used equipment for the joining of metals. The process consists of placing the parts to be welded, one upon the other, between two copper electrodes and simultaneously applying current and pressure. These copper electrodes are of varying sizes and the resulting weld resembles the jointure produced by means of metal rivets. In the usual construction of these machines, one electrode is stationary and acts as an anvil, the other electrode being carried on a hinged arm connected to a foot pedal. When the work is placed between the electrodes and the foot pedal pressed, current flows between the electrodes and a "spot weld" results.

The electrodes usually are water-cooled and vary in size to suit the work. The transformers used are of the same type and construction as used in the butt welders. These machines are used extensively in automobile manufacture, metal box manufacture, wire working plants, ornamental iron works, etc. Another interesting type of this apparatus is the seam welder. In this type of welder the work is carried between electrically-charged rolls under pressure. The action of making the jointure is the same as used in the butt and spot welders and results in a continuously welded seam.

For further study of electric welding in all its branches, the reader is referred to the following firms:

Burke Electric Company, Erie, Pa.; General Electric Company, Schenectady, N. Y.; Westinghouse Electric & Manfuacturing Company, East Pittsburgh, Pa.; Acme Electric Welder Company, Los Angeles, Calif.; Nigg Bros., Covina, Calif.; Welding Service & Supply Company, San Francisco, Calif.; Stone-Ryals Electric Company, San Francisco, Calif.; Far West Electric Welder Company, Seattle, Wash.; Agnew Electric Welder Company, Milford, Mich.; Allweed Supply Company, Boston, Mass.; Electric Arc Cutting & Welding Company, Newark, N. J.; Electric Welding Machine Company, Detroit, Mich.; Lincoln Electric Company, Cleveland, Ohio; Taylor Welder Company, Warren, Ohio; Henderson-Willis Company, St. Louis, Mo.





At left, front view of electric lehrs or glass annealing furnaces at the Illinois Pacific Glass Company, San Francisco. Rear view of same furnaces is shown at right. Conveyors handle glass through the furnaces.

Better Merchandising

June Bride Window Display Prizes Offered by Bureau

Summer Slump May Be Overcome by Active Wedding Gift Merchandising to Friends of the Twenty Thousand Summer Brides

JUNE and bride come in the same breath. Bride and wedding gifts are covered in the next gasp. It is the wise electrical merchandiser who presents his electrical merchandise as the most logical and most sensible of wedding gifts. He will know nothing of this so-called summer slump.

The summer slump is perhaps as deep rooted a tradition as the tradition of marrying in June. However, with active merchandising efforts there need be no summer slump even if there will be always the June bride.

Every kind of merchandiser, from the jeweler down to the house furnishing man plans to capitalize upon the June Bride idea. There is every reason, however, for the selling of electrical gifts as June Bride wedding presents as against any other kind of merchandise at this time.

Activities in June Bride window display and selling are not limited to any particular locality. They may be conducted in the small town electric store even as they are conducted in the big city department store.

The California Electrical Bureau for the fifth consecutive year is setting forth upon a promotional plan for the June Bride electrical gift idea with which any merchandising establishment handling electrical appliances will do well to tie-in immediately.

Poster around which window displays competing for the prize will be designed.

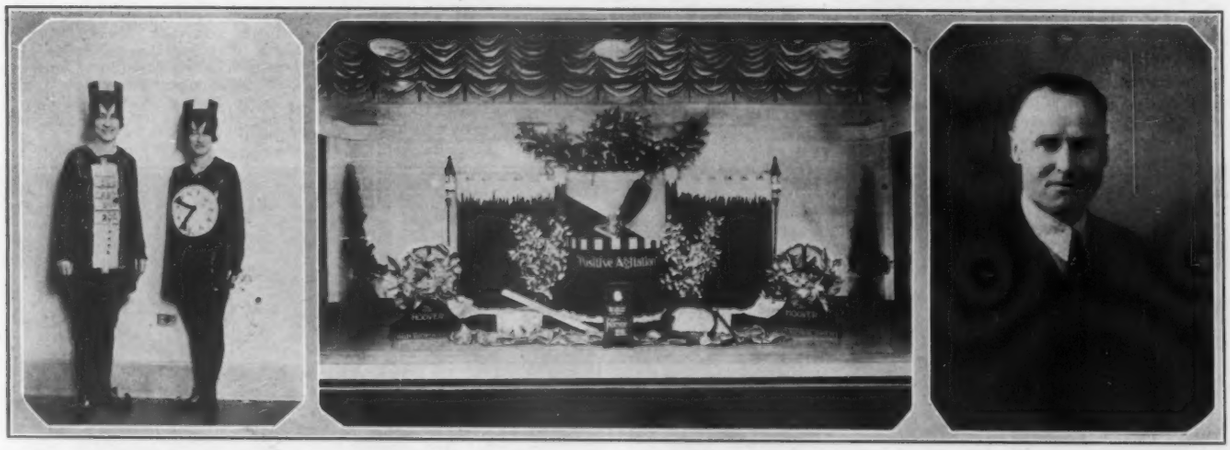
The campaign this year on June Bride activity is to take the shape of a contest for the best decorated window, using a striking poster furnished by the California Electrical Bureau as the central point of interest. The poster being used this year is superior in many ways to any previous poster prepared by this organization. The figure on it is larger and the treatment of the art work more of such a nature as to make it striking and give it carrying power. It can be seen easily across the street and yet will bear close inspection from the front of the window as well.

For the best window display utilizing the California Electrical Bureau's poster, a prize of $50 is to be awarded. For the next five best, prizes of $25, $20, $15, $10 and $5 are to be awarded. All dealers sending in photographs which do not win a prize will receive $1.50 toward helping to repay them for the cost of the photograph.

The window displays will be judged by an impartial committee selected by the California Electrical Bureau. They will be selected upon the basis of attractiveness, sales appeal and display of merchandise. July 6 has been set as the closing date for the receipt of photographs.

It is estimated that there will be over 20,000 weddings in California during the summer months. Taking a very small average of five gifts for each bride, a total of over 100,000 weddings presents, it is estimated, will be purchased during that time.

Prize Winning Becomes a Habit with Valley Electrical Supply



Lillian Broeker and Margaret MacGillivray as Hotpoint twins in costumes which won a prize at the Fresno Ad Club Mardigras. Center: Window by J. U. Berry, advertising manager, Valley Electrical Supply Company, which won third prize in a national contest during Hoover week, the third winning window in annual contests which he has won. Mr. Berry (right) is president of the Fresno Ad Club this year.

Reading from Right to Left—

A Japanese Dealer Tells the Advantages of a Washing Machine

THE M. Furuya Company, Graybar dealers located in Seattle, feeling that their people should enjoy the advantages to be gained from washing machines, conducted a brilliant selling campaign to that end. The advertisement shown calls the washer "A Blessing to the Housewife" and goes on to talk in detail about the various advantages of the machine. Among some of the interesting paragraph headings are: "The Housewife and her Washing;" "Suppose the Washing is made Easy;" "Such an Ideal is Now a Reality;" "The Ideal Machine;" "The Operation;" "The Expense."

Under these various paragraphs are brief, straightforward discussions of the subject. The general effect of the entire advertisement is to make the reader feel that the concern is solicitous of the housewife's well-being and eager to show her why she should own a washer.

"A Blessing to the Housewife" in Japanese

A literal translation of the copy used in the advertisement is as follows:

A BLESSING TO THE HOUSEWIFE

The Housewife and Her Washing

Washing is the hardest of all the housework, and especially where there are children in the family, the housewife spends much of her time and energy in washing.

Suppose the Washing is Made Easy

What will be her joy and happiness when the washing has been made easy and everything in the house, from the children's clothing to sheets and curtains have been washed easily and much better than before, and she can devote her precious time to more profitable work; to the education of her children, and to her rest? Does not this thought occur to you every time you wash?

It takes about 40 minutes or less to wash and wring six to eight sheets or their equivalent, and the electricity will cost you under 1 cent per hour for operation, and this electricity with a small quantity of washing powder soap are all you need.

For a Family of Five

We figure the expense of washing for a month as follows:

Electricity	25 cents
Powdered soap	36 cents
Total	61 cents

Act Quickly for Your Advantage

It is always to one's advantage to act quickly in matters of convenience and economy. It is a fact that all buyers of this machine regret that they did not buy earlier. Is it not true that you always try to spend time efficiently, and to do your work easier?

Even Hot Dogs Prepared Electrically at Saltair

A BLAZE of electric lighting outlining the fantastic contours of the resort buildings has long symbolized the place for summer amusement. Electric lighting, however, is not the only electric use to which central station service may be put around the summer resort. One of the best examples of modernizing the usual summer resort by electricity is to be found at the new Saltair resort near Salt Lake City located on the Great Salt Lake. Here the customary buildings, it is true, are festooned with rows of brilliant and colored lights. Inside the buildings, however, electricity does more than light. The restaurant located in the new Saltair pavillion contains large heavy-duty electric ranges, electric warming tables, electric coffee urns, electric refrigerators, and electrically driven mixing machines.

Electricity makes the hot-dog hot.

The most novel use of electric heat, however, is to be found in the hot dog stand illustrated here. An ingenious hot dog cooking tray, it will be seen by the photograph, has been fashioned. It consists of four trays, placed around the edges of a small table. Each tray is heated by two 500-watt strap-on heating elements separately controlled by a 3-heat switch. Any one of the four trays may be used independently of the others, according to the briskness of the trade and the appetite of the crowd. The apparatus is simple and can be adapted to almost any resort, location or condition.

Serving equipment electrically operated in the new Saltair pavillion near Salt Lake City. Left: electric refrigerators, mixers, serving table. Center: brilliant illumination at night. Right: electric range in the kitchen.

Summertime Ideas in Window

Sell Cookers for Summer Business

CO-OPERATION between two public utilities and the contractor-dealers in the City of San Bernardino, Calif., made possible a highly successful two weeks' campaign on Everhot cookers. The Southern California Edison Company and The Southern Sierras Power Company, both of which maintain an office in San Barnardino, inaugurated the co-operative idea and invited the electrical dealers to participate. In the two weeks campaign, all the sales energy of the combined electrical industry in the city concentrated upon the sale of this particular appliance, with the result that the actual sales exceeded the anticipated quota by 15 per cent. Cleverly arranged window displays, as shown in 1, 2 and 3, backed by the generous distribution of newsprint paper dodgers, carrying copies of the five 16-in. newspaper advertisements which opened the campaign, furnished the stimulus necessary to carry the sale to a successful conclusion. The cooker campaign during the summer has now become an annual sales event for many companies. Dealers and central stations alike share in its participation.

Pedestal tables on which to display merchandise are used by the Bell Electric Company at Auburn (4). They are supported on a pipe column and are permanently fastened to the floor.

Two views (5 and 6) of the new appliance display room of the Los Angeles Gas & Electric Corporation. No appliances are sold, advisory service only being given customers.

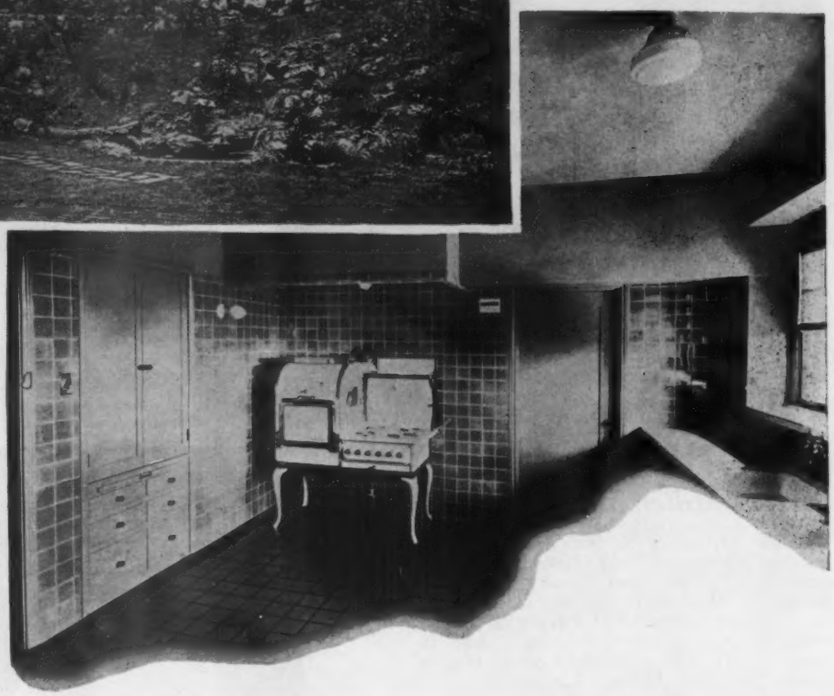
and Merchandise Displays

How Miller Makes Windows

Window trimming is an art in itself. A window which will hold attention and bring in customers is an asset to any merchandising business. Singularly successful has been the H. L. Miller Company of Pasadena, not only in windows but in merchandising. And to his windows Mr. Miller credits a great deal of the store's success. Asked what principles should govern good window design Mr. Miller was emphatic in these statements: "Simplicity is essential. Don't put too much in the window. Build the display around a central piece of merchandise." Mr. Miller urges a window tie-in with all national advertising campaigns because of the identification which it gives the store as the place where the advertised merchandise may be secured. He urges that the electrical merchandiser enter his windows in all prize competitions. Mr. Miller won four national prizes one year.

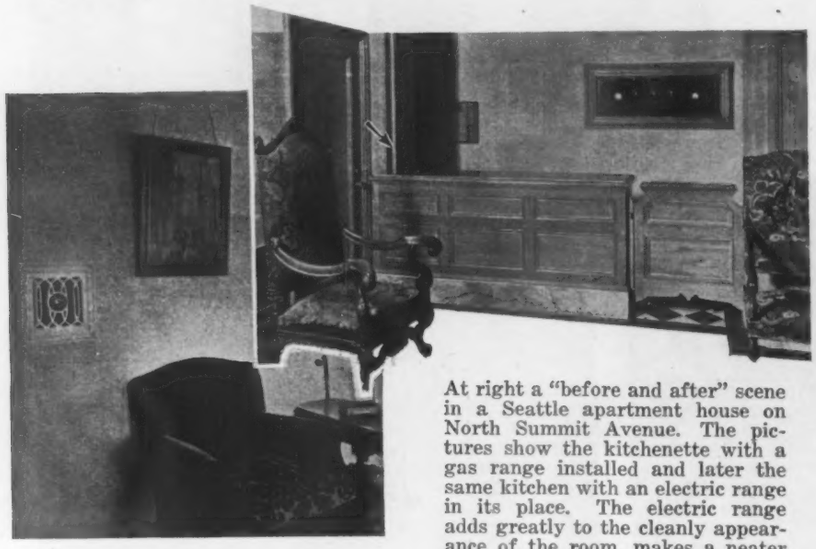
Interesting Residential Installations

Garden of the G. W. Mead home, Beverly Hills, is floodlighted. Below, the attractive electrical kitchen. Note the lighting for the range in the alcove and bracket.



AN outstanding example of comfort, safety and convenience in electrification of a modern home is the new Beverly Hills mansion of G. W. Mead, New York capitalist. A. L. Dickie, the builder, J. Arthur Munroe, the architect, and Barker & Allen, Hollywood Electragists and Check Seal electrical contractors collaborated on the installation of one of the most comprehensive wiring systems, making the Mead mansion a super Red-Seal home. The house has 18 rooms with a total of 417 outlets. This includes 21 yard and floodlights and 11 power outlets. There is a total of 130 switches, 65 of which have the 3 and 4-way control feature. The master control system, from master's suite, servants' quarters, garage, entrance hall, living room, den or screened veranda, has been used. The grounds can be flooded with light from the inside at an instant's notice and the interior lights extinguished just as quickly, giving the occupants full advantage over prowlers. The Los Angeles police recommended this system, as they say the average miscreant is more afraid of light than guns or alarms. A brief resume of the novel features of this installation illustrates the completeness attained.

The living room has 17 convenience outlets, 112 Mazda lamps, 8 tumbler switches, a 25-amp. dimmer for ceiling lights and one radio outlet. The kitchen is equipped with a super-automatic range of 8 kw. capacity, a kitchen ventilator, a large electric refrigerator cabinet and a 1,700-watt Hotpoint plate-warmer. A master radio control unit is located in the lower den. It has 9 outlets connected with the batteries in the basement and double aerial outside, providing 110-volt a.c. circuit and loud-speaker outlets to the various rooms. There is a main switchboard of the dead-front type provided with a 400-amp. main switch, three 100-amp. feeder switches, two 60-amp. feeder switches, four 30-amp. feeder switches, and an 8-circuit panel-board. A combination meter-measuring 110-220 volt service is installed for light and power. On the first floor there is a 12-circuit and 22-circuit panelboard; on the second floor a 24-circuit and in the garage an 8-circuit board. These control a total of 74 circuits, 222 amp. of which are for lights.



Above are scenes in a new apartment building in San Francisco having a master radio installation in the lobby from which all apartments may receive programs. The loud speakers are plainly seen inset in the walls.

At right a "before and after" scene in a Seattle apartment house on North Summit Avenue. The pictures show the kitchenette with a gas range installed and later the same kitchen with an electric range in its place. The electric range adds greatly to the cleanly appearance of the room, makes a neater installation and provides storage space under it for utensils in an attractive cabinet. In the first installation the gas range was too close to walls for safety, but with the electric range this is not a danger.

New Literature on Red Seal Plan Issued

In launching the year's activity for the Red Seal Plan several new pieces of literature of interest have been developed in the Western states.

The Electrical League of Colorado has started a widespread advertising campaign which it is following up by the use of a four-page folder entitled "Making a House a Home." This folder is attractively printed in red and black. It sets out to tell its purpose on the front page, describing the Red Seal Plan and what it means to architects, contractors, builders, home owners and realtors. Opening the folder one finds a two-page table listing the minimum Red Seal specifications for the average house and on the lower part of the sheet a table for rooms in addition to those found in the average house. In the table are listed the number of ceiling outlets, wall light outlets, switches, convenience outlets, and special notes are given describing the most favorable location for these outlets. The back of the folder carries more detail as to the plan and inspection, the checking of wiring plans and specifications, etc. At the bottom of the page is an application blank upon which a prospective builder may apply for information and for examination of the wiring installation to qualify it for Red Seal.

The California Bureau has also issued a new folder to be distributed to prospective home owners and builders. The outside front cover is an attractive one, carrying a picture of a cottage and the announcement that "You, Too, Can Have Convenience in Your New Home."

You, Too, Can Have Convenience in Your New Home
THE extent to which you will enjoy comfort and convenience during the years to come in your new home depends entirely upon the degree to which you plan for those comforts when you build, or look for them if you buy.
MAKING A HOUSE A HOME
of Beauty, Health, Comfort, Convenience and Economy
The Red Seal Plan
Electrical League of Colorado

Literature on Red Seal issued recently

On the inside of the folder is a typical floor plan printed in three colors. Black indicates the regular plan of the house showing the usual outlets such as would be planned ordinarily. In red ink are placed the outlets in addition to the ordinary plans as required under the Red Seal Plan to bring it to Red Seal specifications. Notations are made in red also of increased wattages for ceiling outlets to conform with the Red Seal specifications. In green ink on the same plan is printed a third set of symbols to represent recommendations made by the Bureau for further electrical conveniences. It includes heater plugs, additional wall brackets and convenience outlets, the placing of switches for three-way control, the addition of lighting fixtures and porch lights.

On the back of this folder are listed the Red Seal specifications.

Another piece of literature published recently by the California Electrical Bureau is the Red Seal specification sheet. The old specification sheet has been revised and the items placed in more logical order and certain changes made to conform with more recent standards. These changes include the omission of convenience outlets in reception halls of less than 50 sq.ft. and in the bathrooms and bedrooms used as servants' quarters. It gives also an option of a wall-type air heater in the bathroom in lieu of a convenience outlet. A three-quarter-inch conduit is allowed in accordance with the code. Added to the minimum requirements are a number of recommendations as to the installation of air heating and water heating switches, telephone service, refrigerator service, kitchen ventilating fan and radio outlet.

A Red Seal sales manual is also in the course of preparation.

Bait to Bring in Customers—Certainly But Tell Them Why

One more incident going to show that electrical dealers can talk with frankness concerning advertisment "bait" comes from Salt Lake City, where Dodge Brothers Electric Company, wishing to attract many people to the store, where washing machines could be demonstrated, made a striking free offer. The store offered a 50-cent mechanical pancil of a nationally-advertised make for nothing if the recipient would buy 13 cents worth of leads from that electrical store.

A few years ago hardly an electrical dealer would have thought of publishing such an offer with any reference to his motive. Dodge Brothers Electrical Company, however, frankly let the public know it wished to get people to the store so it could show and demonstrate the things it had for sale. The advertisement expressed the wish that recipients of the pencils would inspect what the store had to offer.

A furniture dealer at Seattle who operates an electrical department, C. R. Tinney, had floor lamps and many other things he wished the public to view at the store. He thought of "bait," of course—and he offered it, with special prices on a certain number of heaters, irons, curling irons, et cetera. He departed from precedent, using a new psychology when he said frankly:

"Now, in order to get you here to see all these things, I am going to make you a very special sale offer which will be good just so long as the articles specified remain to be sold."

Some retail advertisers using "bait" frankly refer to it as such in advertisements!

Dealers are discovering that they are not "letting the cat out of the bag" when they speak frankly about the motive behind special offerings. And the motive —to get many people to the store —is an entirely proper one. If it is announced in advance, and people come feeling under obligation to view other merchandise, why isn't it accomplishing its purpose honestly?

Range Campaign in San Diego Makes Hundred Sales

A successful Hotpoint Range campaign in San Diego County was recently brought to a close. This campaign was sponsored by the Edison Electric Appliance Company in conjunction with the San Diego Consolidated Gas & Electric Company, J. W. Carpenter of the Edison Electric Appliance Company being in charge.

Miss Edna B. Galvin, home economist, demonstrated the ranges and conducted the free cooking school.

Cleverly decorated windows of the Mountain States Power Company, at Casper, Wyo.

Open Season on Refrigerator Sales

All Outlets for Electric Ice Makers Prepared for Season Rivaling Balmiest Days of Automobile Markets

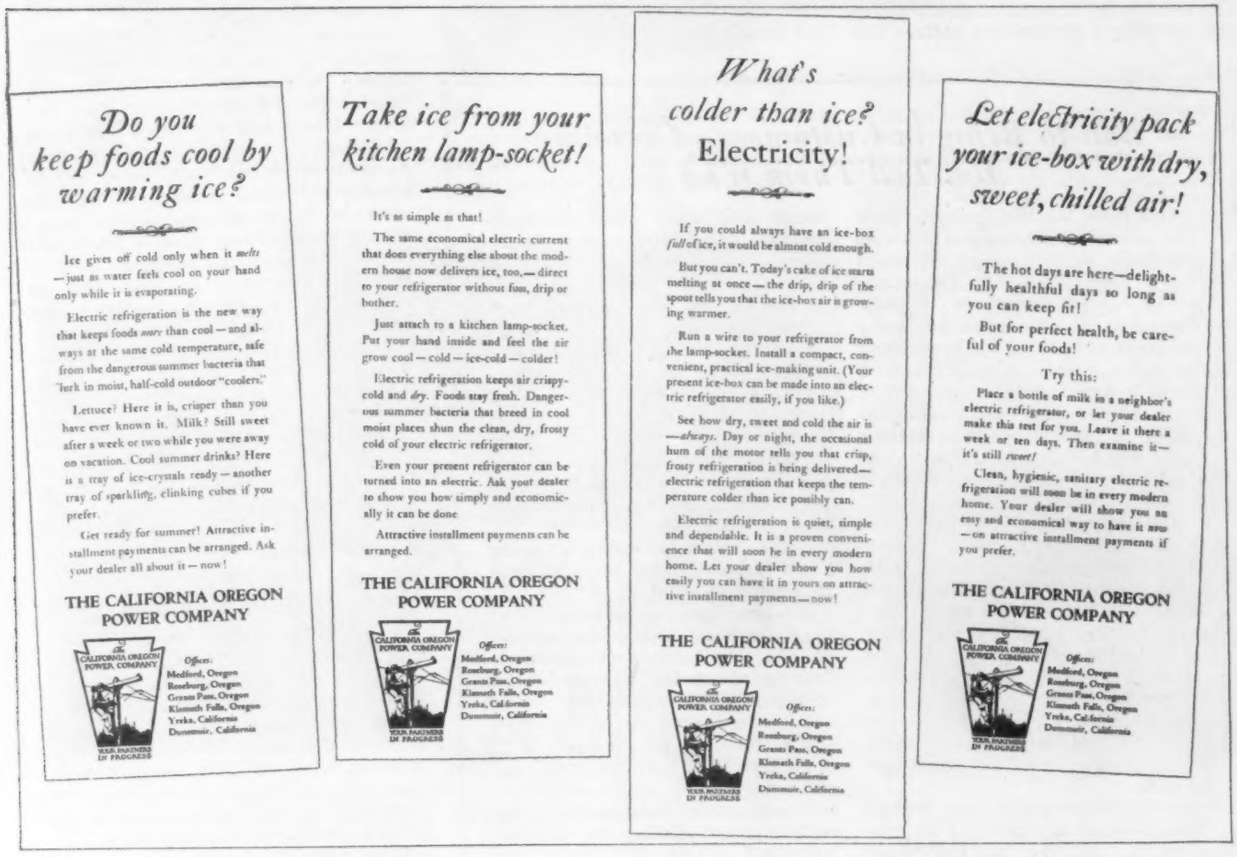
WITH many of the bugs removed from refrigeration sales, policy, servicing and manufacture, the second year of intensive sales effort on electric refrigeration has opened with brighter prospects than at any previous time.

From the manufacturers' standpoint improvements in design and production upon a more completely developed basis will insure better merchandise, far superior to any offered previously.

From the dealers' standpoint general advertising being carried on to further the electric refrigeration idea will result in increased sales to anyone handling electric refrigeration.

The central stations, some of them not merchandising the electric refrigerators directly, nevertheless are backing up the sale of electric refrigerators in every possible way. Window displays such as shown at the top of this page are being used throughout summer months by practically all power companies. The advertising such as shown at the bottom of this page is the kind being used by one company which itself does not merchandise. It is done with the purpose of stimulating the sale of electric refrigerators for all those who handle them.

One of the most notable works of the year—accomplished by the refrigeration committee of the Pacific Coast Electrical Association—has been the publication of a small manual to be distributed to power company employees, giving them information which will make it easy for them to answer inquiries made to them every day by the public as to the facts concerning electric refrigeration.



Do you keep foods cool by warming ice?

Ice gives off cold only when it *melts* —just as water feels cool on your hand only while it is evaporating.

Electric refrigeration is the new way that keeps foods *more* than cool — and always at the same cold temperature, safe from the dangerous summer bacteria that lurk in moist, half-cold outdoor "coolers."

Lettuce? Here it is, crisper than you have ever known it. Milk? Still sweet after a week or two while you were away on vacation. Cool summer drinks? Here is a tray of ice-crystals ready — another tray of sparkling, clinking cubes if you prefer.

Get ready for summer! Attractive installment payments can be arranged. Ask your dealer all about it — now!

THE CALIFORNIA OREGON POWER COMPANY

CALIFORNIA OREGON POWER COMPANY
YOUR PARTNERS IN PROGRESS

Offices:
Medford, Oregon
Roseburg, Oregon
Grants Pass, Oregon
Klamath Falls, Oregon
Yreka, California
Dunsmuir, California

Take ice from your kitchen lamp-socket!

It's as simple as that!

The same economical electric current that does everything else about the modern house now delivers ice, too,— direct to your refrigerator without fuss, drip or bother.

Just attach to a kitchen lamp-socket. Put your hand inside and feel the air grow cool — cold — ice-cold — colder!

Electric refrigeration keeps air crispy-cold and *dry*. Foods stay fresh. Dangerous summer bacteria that breed in cool moist places shun the clean, dry, frosty cold of your electric refrigerator.

Even your present refrigerator can be turned into an electric. Ask your dealer to show you how simply and economically it can be done.

Attractive installment payments can be arranged.

THE CALIFORNIA OREGON POWER COMPANY

CALIFORNIA OREGON POWER COMPANY
YOUR PARTNERS IN PROGRESS

Offices:
Medford, Oregon
Roseburg, Oregon
Grants Pass, Oregon
Klamath Falls, Oregon
Yreka, California
Dunsmuir, California

What's colder than ice? Electricity!

If you could always have an ice-box *full* of ice, it would be almost cold enough.

But you can't. Today's cake of ice starts melting at once — the drip, drip of the spout tells you that the ice-box air is growing warmer.

Run a wire to your refrigerator from the lamp-socket. Install a compact, convenient, practical ice-making unit. (Your present ice-box can be made into an electric refrigerator easily, if you like.)

See how dry, sweet and cold the air is —*always*. Day or night, the occasional hum of the motor tells you that crisp, frosty refrigeration is being delivered— electric refrigeration that keeps the temperature colder than ice possibly can.

Electric refrigeration is quiet, simple and dependable. It is a proven convenience that will soon be in every modern home. Let your dealer show you how easily you can have it in yours on attractive installment payments—now!

THE CALIFORNIA OREGON POWER COMPANY

CALIFORNIA OREGON POWER COMPANY
YOUR PARTNERS IN PROGRESS

Offices:
Medford, Oregon
Roseburg, Oregon
Grants Pass, Oregon
Klamath Falls, Oregon
Yreka, California
Dunsmuir, California

Let electricity pack your ice-box with dry, sweet, chilled air!

The hot days are here—delightfully healthful days so long as you can keep fit!

But for perfect health, be careful of your foods!

Try this:

Place a bottle of milk in a neighbor's electric refrigerator, or let your dealer make this test for you. Leave it there a week or ten days. Then examine it— it's still *sweet!*

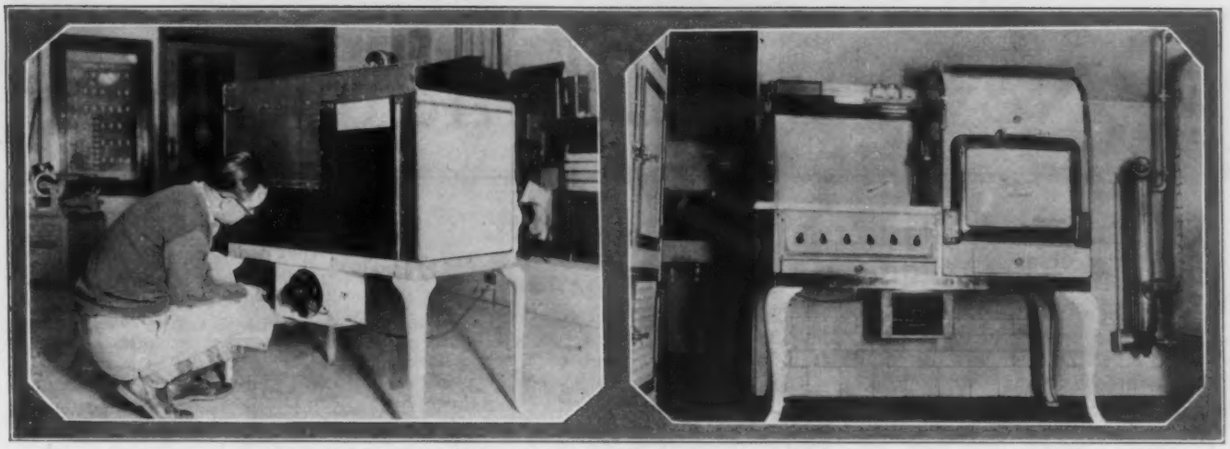
Clean, hygienic, sanitary electric refrigeration will soon be in every modern home. Your dealer will show you an easy and economical way to have it *now* —on attractive installment payments if you prefer.

THE CALIFORNIA OREGON POWER COMPANY

CALIFORNIA OREGON POWER COMPANY
YOUR PARTNERS IN PROGRESS

Offices:
Medford, Oregon
Roseburg, Oregon
Grants Pass, Oregon
Klamath Falls, Oregon
Yreka, California
Dunsmuir, California

Advertisements used by The California Oregon Power Company in 25 northern California and southern Oregon papers last year, one each week. They were produced by the H. K. McCann agency.



"Kelly" Courtright and the kitchen heater with fan developed under his direction. At right a range with heater equipped, showing location of heater.

Kitchen Heater Attached to Range Developed

A KITCHEN heater attached to the electric range itself has long been a necessity in many localities. This demand has been variously satisfied by the use of wood and coal trash burners to which hot water coils often have been attached. The result has been that the electric range has been used less and wood and coal have been used more in such installations.

To make a complete electric home, H. H. Courtright, manager of the Valley Electrical Supply Company, Fresno, in conjunction with a local manufacturer, has devised an ingenious kitchen heater which can be attached to any standard make of range. The heater uses Glowbar elements and one of its features is its forced ventilation system. A small electric fan is made integral with the heater and forces the warm air out from under the stove and throughout the room. During summer months when the heat is not required the fan can be run independently to circulate air about the range.

The first models of this ingenious heater have been arranged to plug in on the range convenience outlet at one side of the range but it is planned to wire the heater to the range circuit in order to leave the convenience outlet free for other appliances.

One of the advertisements used in connection with a recent range school in Salt Lake City.

Salt Lake Range School

A NUMBER of attractive booths were exhibited by various business firms of the city, and a model electrically equipped kitchen also proved to be of much interest to the large audience that attended each day of the Salt Lake Telegram's eighteenth annual cooking school which was conducted in Salt Lake City, Utah, recently. Electric cooking was the featured subject in the lectures and demonstrations given by Miss Alice McCaffree, the instructor.

Many subjects of interest to the housewife in connection with her daily conduct of the home were presented by women especially well qualified to discuss them.

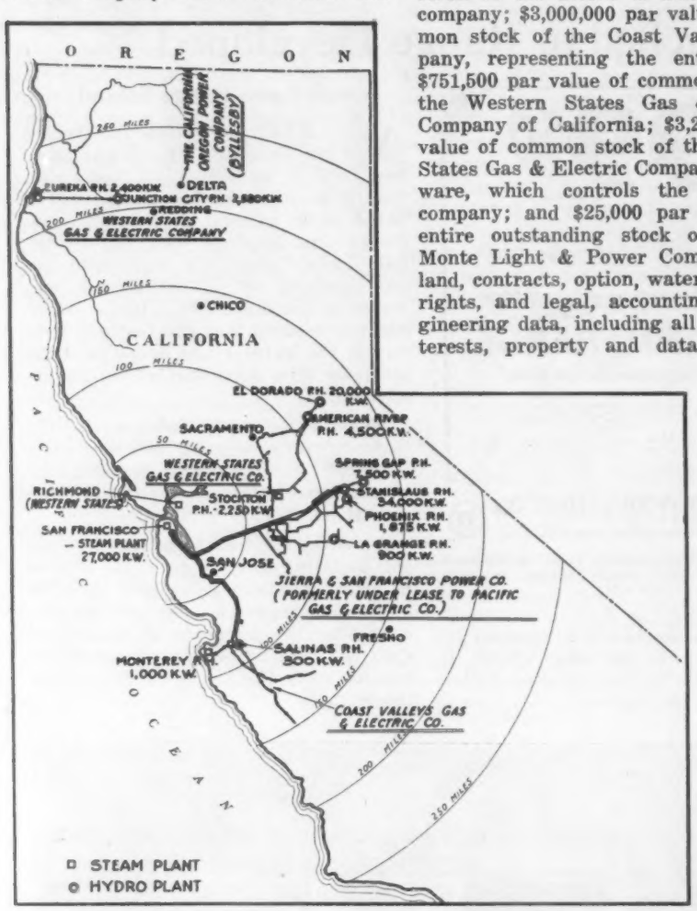
As an added feature a question box was installed near the door, and anyone in attendance was privileged to write a question regarding any subject discussed by the lecturers at the school each day and be certain of a comprehensive reply the following day during the lecture.

Booths of ranges exhibited in connection with a recent cooking school.

News of the Industry

Pacific Gas and Electric Company to Buy Three California Properties

Details of the merger whereby the Pacific Gas and Electric Company, subject to the confirmation and approval of the Railroad Commission of California, will become the owner of three California properties of H. M. Byllesby & Company, Chicago, have been revealed by the filing with the Railroad Commission of a joint application of the former company and the Standard Gas & Electric Company, the Byllesby holding company, for authority to complete the deal. The Pacific Gas and Electric Company, through its president, W. E. Creed, recently announced that arrangements had been concluded with the Byllesby company for the purchase of the Sierra & San Francisco Power Company, San Francisco, Coast Valleys Gas & Electric Company, Salinas, and Western States Gas & Electric Company, Stockton, subject of course to the Railroad Commission's approval.



The three Byllesby properties in California that the Pacific Gas and Electric Company will acquire under the proposed merger. That company's extensive system, which extends from the San Francisco Bay area to its Pit River plants in the northern part of the state, is not shown.

The application asks authority for the Pacific Gas and Electric Company to purchase, and the Standard Gas & Electric Company to sell the following properties and securities: $20,000,000 par value, all of the outstanding capital stock of the Sierra & San Francisco company; $3,000,000 par value of common stock of the Coast Valleys company, representing the entire issue; $751,500 par value of common stock of the Western States Gas & Electric Company of California; $3,253,200 par value of common stock of the Western States Gas & Electric Company of Delaware, which controls the California company; and $25,000 par value, the entire outstanding stock of the Del Monte Light & Power Company; "all land, contracts, option, water and other rights, and legal, accounting and engineering data, including all rights, interests, property and data of every character acquired, connected with a certain power project on the South and Middle Forks of Feather River in California, of which the Bean Creek project is a part."

Authority is asked for the Pacific Gas and Electric Company to issue to the Standard Gas & Electric Company in payment for those securities and properties 260,000 shares of its common stock and $2,085,000 cash. The par value of that stock is $6,500,000, and while the application does not set forth the actual price it is understood that the Byllesby interests will receive the stock at about market value at the time of the deal, which would be around $33 a share. On March 31 last the Pacific Gas and Electric Company had outstanding 5,169,836 shares of preferred and common stock, including stock subscriptions not fully paid or issued. The 260,000 shares proposed to be issued will increase this to 5,429,836, constituting 4¾ per cent of the total.

Exhibits filed with the application show that as of March 31 the companies to be acquired had outstanding, in addition to the stock to be delivered to the Pacific Gas and Electric Company, a total of $50,225,500 in bonds, notes and preferred stocks, all subject to call. This plus the par value of the 260,000 shares and the $2,085,000 cash gives a total of $58,810,000 that the Pacific Gas and Electric Company is to pay for the properties in question.

The property valuation of the three companies as given in the annual report of the Standard Gas & Electric Company as of Dec. 31, 1926, amounts to $73,149,021. That report placed the plant value of the Sierra & San Francisco company as of Dec. 31, 1926, at $39,069,548. This company has been operated for some years by the Pacific Gas and Electric Company under a lease which expires Jan. 1, 1935, and which provides for the payment of all operating expenses, interest and income charges by the lessee and a present annual rental of $150,000. Plant value of the Western States company was given as $26,525,795, gross earnings, $3,407,592, total customers 55,281; and the plant value of the Coast Valleys company as $7,553,678, gross earnings $1,260,219, and the number of electric customers served 10,526.

The application shows that the Pacific Gas and Electric Company also has agreed to purchase from The California Oregon Power Company, also a Byllesby property, for a period of twenty-five years 10,000 kw. of hydroelectric power upon the same terms and conditions and at the same rate that the former company now is purchasing electric energy from the latter.

The proposed merger would place practically all gas and electric properties in northern California, with the exception of The California Oregon Power Company, the Great Western Power Company and the San Joaquin Light & Power Corporation (the latter two controlled by the Western Power Corporation of New York) under control of the Pacific Gas and

Electric Company. The consolidation would make it one of the largest utility companies in the nation with total assets of $407,724,611 and property valuation of $364,450,120.

The Sierra & San Francisco company owns water-power plants in Stanislaus County and a steam plant in San Francisco and transmission lines serving the upper San Joaquin Valley in the vicinity of Modesto and extending to San Francisco and Salinas. The Western States company serves Richmond, Stockton and Eureka and adjoining territory from hydroelectric plants on the American River and other sources, and the Coast Valleys company supplies electric service to a considerable agricultural territory in Monterey County with Salinas as its center.

In the statement issued by the Pacific Gas and Electric Company at the time of the announcement of the proposed merger Mr. Creed said in part:

> The merger of these properties, which have heretofore been a part of the Standard Gas & Electric Company system, under the control and management of the Pacific Gas and Electric Company is both a logical and constructive move in the future development of the electric power service of northern and central California. The territories served by the three merged companies are immediately adjacent to that of the Pacific Gas and Electric Company and in some instances extend within the exterior boundaries of the Pacific Gas and Electric Company; all three companies are substantially interconnected with the Pacific Gas and Electric system and their addition to the latter involves no more than the absorption of contiguous territory and the operation and development under the management of companies already economically and physically joined with the Pacific Gas and Electric Company. Both seller and buyer were moved to consummate the transaction because of its resulting advantages in the rendition of low cost electric service and the added effectiveness possible in the management of the properties under one direction.

Mr. Creed also stated that it was anticipated that J. J. O'Brien, president of H. M. Byllesby & Company, would be added to the Pacific company's board.

Light and Power Rates Cut by Pasadena Light Department

Reduction in light and power rates have been put into effect by the Light and Power Department of the City of Pasadena through an ordinance recently adopted by the board of city directors.

The change cuts the metered street light rate from 3.8 cents to 3.7 cents per kw-hr., while the power rate is amended to provide a reduction to large power users for the straight use of current without penalty for use during the peak period. There is also to be a reduction for off-peak use of power.

The domestic and commercial lighting rates are to be as follows: For the first 100 kw-hr. or less for one month, 5 cents per kw-hr.; for the next 400 kw-hr., 4.5 cents; for the next 500 kw-hr., 4 cents; for the next 1,000 kw-hr., 3.5 cents; and all over 2,000 kw-hr., 3 cents.

The combination domestic lighting, cooking and heating rate is as follows: For the first 15 kw-hr. consumed per lighting circuit per month, exclusive of heating, power or convenience outlet circuits, the regular lighting rates in force, provided that in no case shall there be less than 45 kw-hr. in any one month sold at this rate; for the next 150 kw-hr., 3 cents per kw-hr.; for all consumption in excess of the above in any one month, 2 cents per kw-hr.

Commercial power rates are to be as follows: For the first 150 kw-hr. or less in one month, 4 cents; for the next 150 kw-hr., 3.5 cents; for the next 200 kw-hr., 3 cents; for the next 500 kw-hr., 2.7 cents; for the next 500 kw-hr., 2.6 cents; for the next 500 kw-hr., 2.5 cents; for the next 1,000 kw-hr., 2.2 cents; for the next 7,000, 1.5 cents; for the next 40,000, 1.4 cents; for the next 50,000, 1.3135 cents; for the next 100,000, 1.2 cents; for the next 100,000, 1.15 cents; and for all over 300,000 kw-hr. per month, 1.25 cents.

Mollala Electric Company Bought by Portland Utility

Purchase of the Mollala Electric Company, Aurora, Ore., serving Aurora, Hubbard, Donald and other smaller communities in Clackamas and Marion Counties, by the Portland Electric Power Company, Portland, has been announced by O. B. Coldwell, vice-president and general manager of the latter company.

The Mollala company formerly was controlled largely by E. G. Robinson, who was its president. Its principal power source in recent years was purchased power from the Portland company through a 6,600-volt connection with that company at Hubbard. The newly acquired property will be operated under its own name with A. L. Strickland, formerly in the line department of the Portland company, as manager.

New Japanese Company Incorporated.—The Gifu Electric Company recently was incorporated at Tokyo with a capital stock of 5,000,000 yen, according to Denkinotomo. The company plans to contract for the building of power plants for electric power companies and also to finance other power companies. M. Naruse is president.

To Lower Rates as Experiment in Stimulation of Sales

Acting on its belief that a lowering of the maximum lighting rate to users of electric service would stimulate sales for household purposes and thus reduce service costs, the Southern California Edison Company, after consultation with the Railroad Commission of California in an informal conference, and with its approval, has decided to make an experiment along this line.

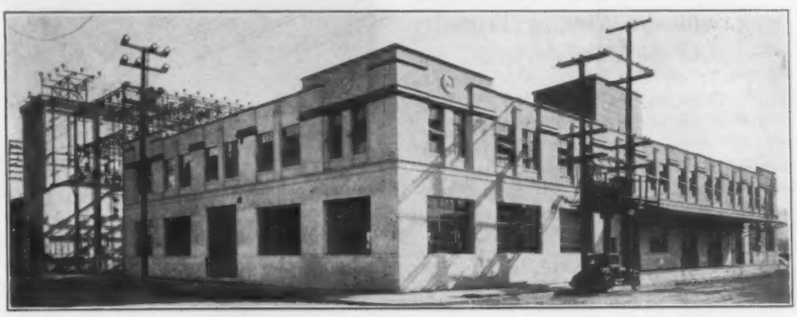
R. H. Ballard, executive vice-president and general manager of the Edison company, following a discussion with the engineering staff, announced the plan will be put into effect July 1, 1927. At the present time the maximum rate for lighting and general household use on the company's lines in southern California is 6½ cents per kw-hr. Under the experimental plan this will be reduced to 5.6 cents, a reduction of 14 per cent. In the San Joaquin Valley territory the present 7-cent rate will be reduced to 6 cents. These reductions will apply to all of the company's 365,000 domestic, agricultural and industrial consumers. It is proposed to try the plan for one year, and at the end of that period a careful check will be made to see if the estimates made by the Railroad Commission have proved correct.

Loss in Merchandise Sales of Seattle Light Department

A loss of the City Light Department of Seattle in merchandise sales in 1926 amounting to $102,000 recently was reported by the city comptroller to the mayor and council, with the suggestion "that steps be taken at once to remedy this defective policy."

This loss amounted to 20 per cent on the gross merchandise sales for the year, which totaled slightly over $500,000. The principal items in the cost of merchandise sales over and above the cost of the merchandise sold, as reported by the comptroller, were: Installation, $73,287.90; servicing, $55,873.25; pay to salesmen, etc., $47,168.49; and advertising, $12,714.28.

Northwestern Company's General Storeroom



The new general storeroom of the Northwestern Electric Company, Portland, adjacent to Albina substation and switchyard visible in the background, houses also repair shops for the plant department and headquarters of the meter and testing department.

Geneva Conference Advocates Trade Barrier Removal

The International Economic Conference at Geneva opened May 4 with forty-seven countries, including Soviet Russia, represented by delegates. The first result of the opening week was the remarkable unanimity of opinion on the necessity of removing trade barriers, according to cables of Edward J. Mehren, vice-president, McGraw-Hill Publishing Company, Inc., who is reporting the conference for the McGraw-Hill papers. All the delegates agreed that repeatedly changing tariffs prevent long-term contracts which are essential for stable trade. There was agreement also on the need of standard customers, nomenclature and classification. It was brought out that international cartels are regarded favorably by many if consumers and workers are protected, and that international supervision and control are wanted by some, but there is much disagreement on this point. The interdependence of nations was stressed by all, thus giving hope that the conference will carry this conviction to the masses of all nations, resulting in gradual economic disarmament.

Henry M. Robinson, president of the First National Bank of Los Angeles, who is chairman of the American delegation, sketched the development of the prosperous industrial situation in the United States, stressing the determination of American employers to secure needed economies by better management and machinery but not by wage reduction, and affirming the American belief that competition stimulates industrial progress. His speech was well received.

It is not expected that the conference will have great or important immediate results but that it will contribute to a better understanding of international problems and will lay a basis for some definite actions now and in the future. Three speakers advocated permanent organizatoin for the study of international economic problems.

The plenary sessions closed Saturday, May 7, and committee sessions on commerce, industry and agriculture began Monday, May 9.

Utility Adopts Standard 3-Panel Frame for Window Trim

To enable the sixty-nine offices and sub-offices of the Southern California Edison Company to present to the public attractive and uniform window trims, the advertising department has developed a standard three-panel frame into which different sets of cards bearing stock-selling points may be used for window background.

These frames are made up of stock picture molding with the two side panels hinged to the center panel. The center panel is 36 in. high and 22 in. wide, while the two side panels are each 22 in. high by 15 in. wide. Each panel is so arranged as to permit of the insertion of the poster card by merely sliding it into grooves at the back of each panel.

These posters are hand lettered in attractive color schemes. Each set is

Hand-lettered posters are inserted in this 3-panel frame adopted by the Southern California Edison Company for window trimming.

permitted to remain on display two weeks in each office and then is sent on to another office.

Power Company Entry Wins First Prize at Ad Mask Ball

A miniature four-pole section of the "figure 4" high-tension line distinctive of the San Joaquin Light & Power Corporation was the novel advertising stunt entered by that company in the Ad Mask Ball given recently by the Advertising Club of Fresno, Calif.

The replica was in exact proportion to the original line, the cross-arms measuring 4 ft. and the poles rising 12

This miniature four-pole section of the San Joaquin Light & Power Corporation's "figure 4" high-tension line construction won first prize in the industrial class at the Ad Mask Ball.

ft. above the floor when carried by four tall linemen. Small electric lamps fed by storage batteries inserted in the poles were suspended from each insulator. The stunt took first prize in the industrial class.

City to Vote to Acquire Utility and Lease Harbor Lands

The Los Angeles city council has voted to place on the ballot at the general election to be held June 7 an ordinance declaring the intention of the city to acquire the electrical system of the Los Angeles Gas & Electric Corporation. Under the proposed ordinance the city may acquire this property either by direct purchase or by condemnation proceedings, the purchase price to be fixed by the California Railroad Commission.

It is intended that this purchase shall include "lands, buildings, steam electric generating plants (the company owns no hydro plants), substations, high-tension and low-tension overhead and underground lines and all rights of way, easements, interests, licenses and franchises in the city of Los Angeles." In addition to these properties, the ordinance provides for the acquisition of the Seal Beach steam generating plant of the company which is located in Orange County just across the county line between Los Angeles and Orange Counties. The transmission between this plant and the city of Los Angeles and all lands and properties "used and useful" in connection with this plant or the transmission line are to be included in the sale.

The ordinance further asks that the city attorney be authorized and directed to file with the Railroad Commission a petition to have the commission determine the amount of compensation the company shall receive, and to institute condemnation proceedings in the superior court.

E. F. Scattergood, chief electrical engineer, pointed out that the action was directly in line with proceedings instituted as far back as 1922 when "the city council adopted its first resolution empowering the city to request the State Railroad Commission to make a valuation of the electric generating and distributing properties of the Los Angeles corporation."

The council also has ordered placed on the ballot a proposed ordinance which would provide for the leasing of certain harbor lands to the Los Angeles Bureau of Power and Light, as a site for the erection of a municipal steam generating plant.

The city has a contract with the Southern California Edison Company which provides that the city shall purchase whatever surplus power may be needed over and above the amount which the city is able to generate in its own aqueduct plants. The Edison company has stood on this contract and has made an issue in the courts of the proposed construction of the harbor plant. An injunction prohibiting the use of the harbor lands for the power plant purposes has been obtained by the company. The court held that this land had been transferred by the state to the city for harbor purposes exclusively. This latest move by the city council has been interpreted as an attempt to legalize the use of the harbor lands in question as power plant sites.

Prominent Speakers on N.E.L.A. Convention Program

The relation of the development of the electric light and power industry to the extraordinary economic development in the United States during the last decade will be the subject around which will center the program of the fiftieth convention of the National Electric Light Association to be held in Atlantic City June 4-10. Every phase of the industry will be covered by prominent speakers, among them R. F. Pack, president of the association; M. L. Noon, director American Farm Bureau Federation; Mrs. Mary King Sherman, president, General Federation of Women's Clubs; Earl Whitehorne, commercial editor, Electrical World; William Green, president, American Federation of Labor; M. H. Aylesworth, president, National Broadcasting Company, Inc.; J. F. Shaughnessy, president, National Association of Railroad & Utilities Commissioners; Bancroft Gherardi, president, American Institute of Electrical Engineers, and J. A. Fowler, past president, Association of Electragists, International.

There will be six general sessions, for which carefully selected programs have been planned. All these will be held in the morning, with the exception of the third, which will convene Wednesday, June 8, at 2:30 p.m. Reports of the section committees will be heard at the section sessions, all of which will be held in the afternoon. The report of the Public Policy Committee will be given at the session on Wednesday evening by the chairman, R. H. Ballard, vice-president and general manager, Southern California Edison Company. A program also will be presented at that session which will include an address by the Honorable David F. Houston, former Secretary of the Treasury, and musical numbers.

Features of the entertainment program planned include the president's reception, ladies' card party, golf tournament, special ladies' day at Seaview, sports and dancing.

An innovation at the Golden Jubilee convention will be the parade on the Boardwalk Saturday afternoon, June 4, featuring the opening of the electrical exhibit held in conjunction with the convention. All business sessions of the convention will be held on the Million Dollar Pier except the afternoon session of the Accounting Section on June 7, which will be held at the Hotel Traymore.

New Washington Utility Plans Two Power Plants

The Cascade Power Company of Seattle, organized by employees of the Puget Sound Power & Light Company, has filed application at Olympia, Wash., for permission to appropriate water from Lake Isabel in Snohomish County and the Wenatchee River, in Chelan County. The application declares that the company will expend $9,800,000 in power development, of which $8,250,000 is to go for erection of a reservoir and power plant in Tumwater Canyon one mile south of the town of Chiwaucum in Chelan County, and $1,300,000 for hydroelectric construction at the Lake Isabel site, northeast of the town of Gold Bar in Snohomish County. Work on the former is slated to begin June 1, 1928, and to be completed within three years, while the latter is to be started Sept. 1, 1928, and completed in two years. The total output from the two plants, which are not to be in series, is estimated at 77,500 hp.

Personnel of the company includes: president—Lionel J. Bourke, who is assistant to W. H. McGrath, vice-president of the Puget Sound Power & Light Company; vice-president—Frank Walsh, an engineer in the power company's employ; treasurer—P. D. Jennings, employed in a similar capacity; secretary—Emory E. Hess, of the Puget Sound Power & Light Company's legal staff.

The Cascade company is said to have no connection with the Puget Sound company but it expects to sell its output to the latter company.

Court Rules Plant Operators Must Protect Public

Ruling that power plant operators are bound to observe and protect the safety of all persons in the habit of frequenting their premises, the supreme court of Wasington recently upheld the $25,000 judgment given Mabel Clark against the Longview Public Service Company of Longview, Wash. Affirming the Cowlitz County superior court, the supreme court found that there were no warning signs in the pumphouse of the utility's property where large numbers of Longview residents visited. The girl was injured when she thrust her head through an open window in the pumphouse and grasped a rod which had become charged through an arc-over of 6,700 volts from high-tension wires.

"The duty of high-voltage electricity owners," the decision read, "to all persons, whether invitees, licensees or trespassers, who it may have reason to believe may come into its proximity, is to protect them from injury and it cannot relieve itself from liability even against a trespasser."

California Amendment Would Establish New Water Conservation Policy

A proposed constitutional amendment to establish a new water conservation policy in California by limiting the old common law of riparian rights to apply only to reasonable and beneficial use of water has been passed by both houses of the California Legislature. The measure now will go to a vote of the people.

The amendment seeks to prevent the waste of waters of the state by declaring "that because of the conditions prevailing in this state the general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable, and that the waste, unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare."

It further provides:

"The right to water or to the use or flow of water in or from any natural stream or watercourse in this state shall be limited to such water as shall be reasonably required for the beneficial use to be observed, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.

"Riparian rights in a stream or watercourse attach to, but to no more than, so much of the flow thereof as may be required or used consistently with this section for the purposes for which such lands are or may be made adaptable, in view of such reasonable and beneficial uses, provided, however, that nothing herein contained shall be construed as depriving any riparian owner of the reasonable use of water of the stream to which his land is riparian under reasonable methods of diversion and use, or of depriving any appropriator of water to which he is lawfully entitled."

Water rights long have been a fruitful source of dispute in California, and the matter recently was brought to a head by the suit brought by the Herminghaus heirs against the Southern California Edison Company in which the ruling, made by the superior court and upheld by the supreme court, was to the effect that the Southern California Edison Company might not impound the waters of the San Joaquin River and its tributaries to such an extent as to prevent the annual overflow of the river and the consequent inundation of the Herminghaus acreage. The company was enjoined from storing flood waters of the river in its Florence Lake reservoir in order that the flood waters of the river might overflow the plaintiff's lands and so furnish the few acre-feet of water necessary annually to irrigate them. The Edison company had contended that the method used by the plaintiffs was wasteful and that under the Water Commission Act the company had the right to impound water which otherwise, for the most part, would flow unused into the ocean. (Electrical West, January, 1927, p. 47.)

The decision of the California courts, which the supreme court of the United States recently consented to review, resulted in an immediate effort to obtain a constitutional amendment to limit riparian rights to a reasonable and beneficial use of the water.

Correction of Valuation Errors Upheld by Supreme Court

The right of the department of public works of the State of Washington to correct errors in valuation previously made by it has been upheld by the supreme court. The highest court reversed the action of the Thurston County superior court in setting aside the department's order issued in 1925, fixing the valuation for rate-making purposes of the Pacific Power & Light Company at $6,332,046 as of Dec. 31, 1924, and eliminating generating and transmission properties in Oregon valued at $873,922, which were used in 1913 to provide energy for the State of Washington but which now are not so used. The cause was remanded to the superior court with instructions to affirm the department. The ruling affects the Walla Walla-Yakima territory and fourteen cities, all of which were intervenors with the department of public works.

The supreme court decision held that the superior court had jurisdiction to review the order in the valuation case under discussion, because this case was preliminary and necessary to the rate-making proceedings of which the valuation case was but a part, but declared that the trial court erred in holding that the department could not controvert its earlier orders in this instance. The decision hinged on whether or not a "palpable" error had been made by the department in not removing the Oregon properties from the valuation of the company's Washington properties as of Dec. 31, 1919. The department considered that such error had been made in that former order and attempted to correct it in its order of 1925. The superior court of Washington for Thurston County reversed this order (Journal of Electricity, May 15, 1926, p. 494), and the present decision of the supreme court reverses that decision.

University Bureau Aids Industry in Personnel Work

The Alumni Bureau of Occupations, the center for placements for University of California graduates and students, is operated for their benefit by the California Alumni Association. Its aim is to supply satisfactory human aid in the business and industrial world by finding "places for men and women which will give them an opportunity to develop their talents to the fullest extent in ways which will bring mutual satisfaction to themselves and their employers." It has made a special study of fitting the individual to the position.

An announcement issued recently by the bureau regarding the type of placement in which it specializes said in part:

> We are engaged in placing university-trained men and women we know personally in professions and positions for which their individual ability qualifies them. From letters sent us by employers we know that we are in this way able to eliminate much of the lost motion and consequent expense which is incurred by all types of business when adding to its personnel. We charge no fee for our work, and we, therefore, are concerned, not that our placements shall bring financial gain, but only that they shall bring satisfaction and assistance to the firms we are serving.
>
> As the University of California is in effect the largest "plant" in the state and one in which every taxpayer is a stockholder, it is the logical place for business men to look for competent assistance. Having spent four years being made better citizens and better thinkers at the expense of the state, graduates of the university generally are thoroughly grounded in those fundamentals so necessary to real business success, and, properly placed, are capable of making a genuine contribution to the establishments they enter.
>
> These facts already are recognized by many of the larger corporations which today look almost entirely to the universities for the material which they expect to develop into executives and administrators. But university graduates also are trained in scores of fields besides the industrial. Many of them are equally well equipped for mercantile, advertising and other fields.

The Alumni Bureau of Occupations has offices at 301 Stephen's Union, Berkeley, and 855 N. Vermont Avenue, Los Angeles.

Page Izaak Walton!

An 8-oz. rod and line tested for 18 lb. in the hands of R. M. Boykin, manager central district, Puget Sound Power & Light Company, Seattle, landed this 61-lb. Royal Chinook from the Cowlitz River, Wash., last month in a grueling 40-minute fight, in which a jammed reel furnished the element of suspense. By wading ashore from the boat and from there following on foot the rushes of the fish, the undaunted angler was able to keep the line just taut enough and, eventually, to win.

Public Utilities Commission Is Planned by San Francisco

An amendment to the San Francisco charter drawn up by the city attorney which would create a public utilities commission has been accepted by the board of supervisors and ordered placed on the ballot of the general election to be held Nov. 6, 1928. This date comes within the six-month period prior to the next session of the Legislature, as required by law. Demand for a public utilities commission has been brought about through discussion of the bond election to be held in San Francisco June 14 to vote on the proposed purchase of the properties of the Spring Valley Water Company. Pending action on the amendment the supervisors are considering a plan for temporary operation of those properties if the bond issue is approved at the election.

The proposed amendment provides for a public utilities commission of three members to hold office for six years, one to go out of office every two years. The commissioners would be appointed by the mayor and confirmed by the board of supervisors, each commissioner to be paid $20 for each meeting attended, with the proviso that no member would receive more than $2,000 per annum. Each commissioner would be required to furnish a bond of $25,000.

The commission would have absolute control of "the construction, management, supervision, maintenance, operation, extension and control of all public utilities used, owned, leased, acquired and constructed by the city and county of San Francisco." It would have authority to sell bonds voted for these purposes and would fix rates and fares. It would be required to appoint a utility manager who, with the submanagers of the several departments or bureaus, would not be subject to civil service provisions, would report directly to the commission and would be removable at the pleasure of the commission. Water and transportation would be the bureaus first to be established, and a power bureau would be organized if and when the city actually enters the power business. As long as the various utilities were self-supporting the commission would have absolute control and would refer to the board of supervisors only if and when money from the general tax fund was needed.

Grays Harbor Company Absolved from Liability for Death Due to "Act of God."—The Supreme Court of the State of Washington has confirmed the decision of the Grays Harbor County Court in denying damages to the heirs of Gustave Quarnstorm, who was found dead on a city street in contact with a live electric wire which had been torn from its fastenings by a severe storm. The court held that this storm, which occurred in December, 1923, was "an act of God and not controlled by the Grays Harbor Railway & Light Company," against which the Quarnstorm heirs had brought suit.

California Electrical Bureau Makes Personnel Changes

HERBERT W. STITT

GEORGE M. RANKIN

Two changes in personnel of the California Electrical Bureau recently have been effected, due to the resignation of W. F. Brainard, who had been field representative of the bureau in Los Angeles. Mr. Brainard's successor is George M. Rankin, formerly the bureau's field representative in the San Joaquin Valley, with headquarters in Fresno. The vacancy caused by the transfer of Mr. Rankin has been filled by Herbert W. Stitt, who resigned as head of the electrical department in Fresno to take up the work with the bureau.

Both men are well qualified for their duties. Mr. Stitt's early experience in electrical work covers four years with the Pennsylvania Railway, one year with the Westinghouse company, and some time with the Copper Queen Consolidated Mining Company, Douglas, Ariz., whence he went to Suisun, Calif., to take charge of the electrical work of the Pacific Portland Cement Company's plant there. In 1912 he was appointed electrical inspector and city electrician of Fresno and has held those positions ever since, gradually becoming the head of the electrical department. Mr. Stitt was the founder and first president of the California Association of Electrical Inspectors, which was organized in Fresno in 1924.

Mr. Rankin, after graduation from technical school, entered the navy where he was wireless operator, and at the time of his discharge in 1910, chief electrician. He then went to San Francisco as operating superintendent for the United Wireless Company and the San Francisco Chronicle, following that with four years in the employ of the Great Western Power Company as underground service foreman. During the World War he was operating and construction superintendent for the Southern Manganese Corporation of Anniston, Ala., and after the war he became operating superintendent for the Pacific Electro Metals Company, Bay Point, Calif. From 1920 to 1923 he was engaged in the contracting business for himself in Selma, Calif., and then became associated with the California Electrical Co-operative Campaign, the predecessor of the California Electrical Bureau.

Seattle Prepares to Construct Diablo Canyon Unit

The Seattle city council has passed an ordinance providing $85,000 for immediate construction of a diversion tunnel necessary to divert the water from the Skagit River bed while a dam is being built across Diablo Canyon. This is the Diablo Canyon unit of the city's Skagit River hydroelectric project. The ordinance was passed after considerable opposition from several council members who believed the tunnel contract should be awarded at the same time as the dam contract. It finally was passed on the ground that if the tunnel contract is awarded now, the tunnel will be ready for use by the time the dam contract is let.

The council also has adopted an ordinance authorizing the employment of the Constant Angle Arch Dam Company of California to draft plans for the $3,400,000 dam, and to act as consulting engineers during its construction. The total amount to be paid the company, on a 4 per cent basis, is not to exceed $60,000. Engineers for the company have made an exhaustive survey at the Diablo site and submitted general designs to the council. City officials expect to award contract for the dam by Aug. 1 and to have construction started by Oct. 1 and completed by the fall of 1928.

Permits recently granted to the city of Seattle by the Federal Power Commission for hydroelectric development at Diablo Canyon and Ruby Creek on the Skagit River authorize the city to install the following units under prior rights: Concrete dam at the Ruby ripraps to raise the water level 400 ft. and create a reservoir of 1,300,000-acre-ft. capacity; concrete dam at Diablo Canyon raising the water level 300 ft. and creating a 90,000-acre-ft. reservoir extending upstream to the Ruby dam; concrete dam at the intake of the present Gorge plant, raising the water level 100 ft.; power plants at the Ruby ripraps and Diablo; transmission lines connecting these plants with the existing $11,000,000 Gorge project.

Los Angeles Utility Engineer Awarded Scroll of Honor

H. A. BARRE

Proclaiming H. A. Barre, executive engineer for the Southern California Edison Company, the outstanding member of the engineering profession in Los Angeles for the past year, the Los Angeles Chapter of the American Association of Engineers awarded to him the scroll of honor at its third annual dinner held recently at the University Club, Los Angeles.

Mr. Barre has been connected with the electrical industry in southern California for the past twenty-five years. He was with the Pacific Light & Power Corporation before that company was absorbed by the Edison company. While he has had a wide and varied experience in the power industry his most notable achievements have been in the economic and engineering phases of high-voltage transmission of power over long distances.

With the inception of the development of the San Joaquin River—Big Creek project of the Southern California Edison Company in 1911 the necessity for transmitting electricity a distance of more than 240 miles made it necessary for the company to use 150 kv. as the transmission potential. Credit for the success of this venture is given to Mr. Barre. In 1923 under his direction this line was converted for operation at 220 kv. It is estimated that this change in voltage ultimately will effect economies in transmission costs to the company of more than $40,000,000 on the entire Big Creek project.

Carl Heinze, engineer of distribution for the Bureau of Power and Light of Los Angeles, made the presentation of the scroll, and Paul S. Ehlers, past president of the chapter, acted as toastmaster. Two years ago the scroll was awarded to William Mulholland, chief engineer of the Los Angeles Bureau of Water Works and Supply, and last year it was presented to Arthur S. Bent, head of a firm of engineering contractors with headquarters in Los Angeles.

Donald M. Baker, former head of the Division of Water Rights for the state of California and a vice-president of the American Association of Engineers, was the principal speaker of the evening.

News Briefs

Colorado River Commission Bill Signed by California Governor.—Gov. C. C. Young of California recently signed a bill providing for the establishment of a state commission to safeguard the state's interests in the Colorado River. The bill authorizes the governor to name a commission of three "to hold meetings and conferences within and without the state, with representatives of other states or communities and with representatives of the United States relative to interstate agreements, compacts, water rights, and any and all things in which California or its citizens are or might be interested or relating to the Colorado River." The commission also is empowered to take such steps as it may deem necessary or advisable to protect the interests of California and its citizens in the water of the river; to appear before Congress; to obtain the service of expert assistants and to call upon any other state department or officials for aid or information. The act carries with it an appropriation of $25,000 for expenses.

N.E.M.A. Appoints Patents Investigation Committee.—A committee has been appointed by Gerard Swope, president, National Electrical Manufacturers Association, to investigate the situation regarding patents in the electrical industry to determine whether some modification of the plan utilized by the National Automobile Chamber of Commerce may be made applicable to the electrical manufacturing industry. The committee consists of Leonard Kebler, president, Ward Leonard Electric Company, chairman; A. G. Davis, vice-president, General Electric Company; A. Atwater Kent, president, Atwater Kent Manufacturing Company; M. C. Rypinski, vice-president, Federal Brandes Company; B. E. Salisbury, president, Pass & Seymour, Inc., Harold Smith, general solicitor, Westinghouse Electric & Manufacturing Company; Charles H. Strawbridge, president, Goodman Manufacturing Company. Alfred E. Waller, managing director, and Francis E. Neagle, legal counsel of the association, are ex-officio members.

Los Angeles Company Orders Supervisory Control Equipment for Substation.—The Los Angeles Gas and Electric Corporation recently placed with the Westinghouse Electric & Manufacturing Company an order for complete supervisory control equipment for its substation No. 18. The synchronous visual type of control with all-steel panel mounting throughout will be used. At present this installation will include twenty control units and ten metering units, with provision made ultimately to increase to fifty control units and ten metering units. The substation eventually will be of 15,000-kva. capacity, with three 5,000-kva. transformer banks. Four 33-kv. lines come into the station, and the ultimate outgoing capacity will be fifteen feeders of 4 kv. each. Readings of current on the low side of each transformer bank may be obtained at the control office through selective remote control metering.

Second Unit to Be Added to Rogue River Plant.—Announcement has been made by The California Oregon Power Company that a second 22,000-hp. unit will be added at once to its hydroelectric plant, Prospect No. 2, now under construction on the North Fork of the Rogue River in Oregon. Original plans called for an initial installation of one 22,000-hp. unit and an ultimate capacity of 66,000 hp. (Electrical West, February, 1927, p. 107.) Work on the first unit is expected to be finished by Oct. 1, 1927. A high-tension transmission line will be built to connect the new plant with the company's transmission system at Medford, Ore., and in connection with the installation of the second unit this line will be extended to connect with the company's hydroelectric plants, Copco No. 1 and No. 2.

Power Company Employees Awarded Service Buttons.—Service buttons recently were presented to employees of the Pacific Power & Light Company in the Pasco-Kennewick district who have been in the service of that company for ten years or more. Those who received buttons were J. H. Siegfried, superintendent of power, 15 years; Lou Happy, construction foreman, 25 years; C. E. Shinn, line foreman, 12 years; Charles Bunnell, right-of-way department, 10 years.

Mountain States Company Buys Midwest Electric Service Company.—Purchase of the Midwest Electric Service Company, with headquarters at Casper, Wyo., by the Mountain States Power Company, Tacoma, was announced recently by C. M. Brewer, vice-president and general manager of the purchasing company. The properties of the Midwest company comprise small generating units and distributing systems in ten towns in Wyoming and two in South Dakota. They are to be thrown into the Casper division of the Mountain States company, of which W. F. Johnson is manager.

Boulder Dam Association Re-elects President.—John L. Bacon, former mayor of San Diego, Calif., was re-elected president of the Boulder Dam Association at its annual meeting held recently at Las Vegas, Nev. S. C. Evans of Riverside, Calif., was re-elected executive secretary.

Artistic Lighting Equipment Association Has New Address.—The office of the Artistic Lighting Equipment Association has been removed from Cleveland to Room 711 Graybar Building, 420 Lexington Avenue, New York.

Foshay Company Buys Arizona Company.—The Southern Arizona Power Company, which supplies Nogales, Ariz., with electricity, gas and artificial ice, has been purchased by the W. B. Foshay Company.

New S.E.D. Headquarters.—Headquarters of The Society for Electrical Development now are in Room 600 Graybar Building, 420 Lexington Avenue, New York City.

Northwest Electric Light & Power Association

Convention Plans Well Laid for Business and Pleasure

That the coming convention of the Northwest Electric Light and Power Association to be held in Salt Lake City June 21-24 will be the most successful in the history of the association is the announcement of P. M. Parry, commercial manager of the Utah Power & Light Company and general chairman on convention arrangements. Very satisfactory progress is being made in perfecting every detail for the comfort, convenience and entertainment of the large number of guests who will be there.

Speakers of national prominence in the electrical industry will be on the program. These include H. T. Sands, new president of the National Electric Light Association; Paul Clapp, its managing director; John B. Miller, president, Southern California Edison Company; J. E. Davidson, vice-president and general manager, Nebraska Power Company and chairman of the Commercial National Section; and W. H. Onken, Jr., editor of Electrical World.

Entertainment plans include a trip to Bingham, Utah, Tuesday afternoon, June 21, and the president's ball at the Hotel Utah in the evening. On the next day a luncheon for the ladies will be given at the Country Club, followed by a trip to Saltair. The feature of Thursday afternoon will be a golf tournament followed by a tea for the ladies given by Mrs. D. C. Green, wife of the president of the association. In the evening there will be a dinner dance in the roof garden of the Hotel Utah. On Friday at noon a special organ recital will be given in the Tabernacle.

The golf tournament undoubtedly will prove to be one of the most popular features of the convention. Competition in the tournament will be for the

Kilowatt and Manning-Bowman cups, with additional prizes for low gross and high gross scores, longest drive, birdies and women's putting contest. The tournament will be played over eighteen holes, with each contestant eligible to win only one prize. Prizes will be as follows: To the winner of the Kilowatt Cup a golfer's duffle bag; to the runner-up in this event or the man with the next lowest net a Spaulding driver; to the winner of the Manning-Bowman Cup a golfer's duffle bag; to the runner-up in this event a Spaulding driver; to the man making the lowest gross score a golfer's duffle bag; as a consolation prize to the man with the highest gross score a practice putting machine; to the man making the longest drive a matched set of sweater and socks; to each man for each birdie made a Kroflite golf ball; to the woman winning the putting contest a five-pound box of candy.

From present indications it is expected that attendance at this convention will exceed that of any previous one held by the association. Salt Lake City's location, its many amusement and recreational facilities and scenic attractions assure its guests on this occasion an exceptionally pleasant time, in the opinion of those in charge of arrangements.

A. I. E. E.

Los Angeles Section will hold its final meeting of the season Saturday, June 11, 1927. The afternoon will be spent at the new Long Beach steam plant of the Southern California Edison Company. Dinner will be served in the evening at Long Beach and will be followed by talks describing the equipment at the plant. The Section will resume monthly meetings in October.

Los Angeles Section at a recent election by mail ballot elected the following officers for the year: L. C. Williams, district manager, Pacific Electric Manufacturing Company, chairman, succeeding R. E. Cunningham of Farnham & Cunningham; H. L. Caldwell, executive assistant, distribution division, Bureau of Power and Light, secretary, succeeding Mr. Williams; N. B. Hinson, system planning engineer, Southern California Edison Company, assistant secretary. The executive committee will be composed of Prof. P. S. Biegler, of the department of electrical engineering, University of Southern California; W. F. Grimes, meter engineer, Westinghouse Electric & Manufacturing Company; H. W. Hitchcock, transmission and protection engineer, Southern California Telephone Company; and J. G. Rollow, electrical engineer, Los Angeles Gas & Electric Company. The new officers and members of the executive committee will assume their duties Aug. 1.

The summer convention of the American Institute of Electrical Engineers will be held at the Book-Cadillac Hotel, Detroit, June 20-24. A large number of papers on practical operating subjects, including power stations, transmission-line operation, relays, control circuits, cable joints, communication, dielectrics, corona, rectifiers, electrical units and electric traction, will be presented at the technical sessions. The reports of the technical committees covering practically all fields of electrical engineering will be given on Wednesday, June 22, and a feature of the sessions on Friday, June 24, will be five papers on catenary suspension. Interesting plans for the entertainment of the delegates include golf and tennis tournaments, sightseeing trips, a moonlight excursion, dancing and sports.

Pacific Coast Electrical Association

Advertising-Publicity Section Has Interesting Meeting

At the fourth meeting of the Advertising-Publicity Section, P.C.E.A., held recently in Los Angeles, the morning session was spent mainly in discussion of and action on matters in connection with the coming convention. Progress of the 3-minute speaking contest activities in the individual companies was reported on, practically all members stating that interest was widespread among employees of the different organizations.

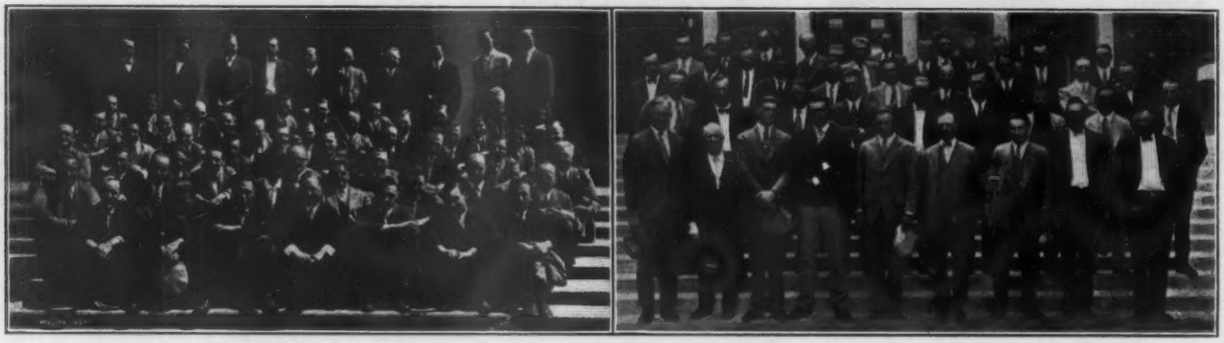
After luncheon, as guests of the Los Angeles Electric Club the members of the section reconvened for the afternoon session which was given over to a study of "Supplemental Advertising," segregated into three classes—"Outdoor Advertising," "Advertising with Electric Signs," and "Street Car Advertising." The first was discussed by R. S. Montgomery, general sales manager, Foster and Kleiser Company, who told in considerable detail of the successful work of that company in 600 cities and towns of four Pacific Coast states. The second subject was handled by Paul D. Howse, president, Electrical Products Corporation, who traced the early history of illuminated signs and stated that the invention of the incandescent electric lamp began the development of electric signs as they are today. The third was the subject of a talk by Mr. Hannigan of the Pacific Railways Advertising Company, who, after telling of the beginning of street car advertising forty years ago on a single line in a small Eastern city and comparing that with its widespread use today, pointed out the features that made for effectiveness in that medium of advertising.

Costs and Customers' Accounts Discussed at Accounting Section Meeting

The importance of accountancy as a highway to executive work, the handling of customers' accounts, costs, and the classification of accounts were the main topics of discussion at the regional meeting of the Accounting Section, P.C.E.A., held in Los Angeles April 7. H. W. Johnson, Coast Counties Gas & Electric Company, chairman of the section, presided, and after some short introductory remarks read a paper by J. H. Jackson, professor of accounting, Graduate School of Business, Stanford University, on "Accountancy —A Highway to Executive Work." Professor Jackson pointed out the important and strategic position that the executive in charge of accounting holds in a business organization and emphasized the fact that the basic training which the accountant must have and the wide knowledge of business that he gains through the practice of his profession, coupled with the ability to think clearly and accurately, to respect a confidence, to keep his own counsel and to be tolerant of opposing opinions, open the way to great opportunities, particularly in the public utility field.

O. L. Moore, of the Los Angeles Gas & Electric Corporation, in the absence of E. W. Hodges, Pacific Gas and Electric Company, chairman, reported on the work being done by the customers' records committee. He stated that the committee is studying the seven distinct systems in use by the utilities of the Pacific Coast; that it was expected that by the time the convention period has arrived the committee chairman will have investigated each of these systems' methods of handling customers' accounts; and that it was "hoped that the committee may be able to present a report which will close this question until such time in the future as some very radical improvement is suggested."

C. P. Staal, Southern California Edison Company, suggested for the consideration of the section an investigation



Left—Forty men and apparently one woman attended the short course for metermen given recently at the California Institute of Technology, Pasadena. Right—The class at the University of Arizona, Tucson, beat the enrollment record at Pasadena by three.

of the requirements of the Federal Power Commission regarding gross and net revenues, and presented a copy of his suggestions which the chairman agreed to submit to the classification of accounts committee.

R. A. Hornby, valuation engineer, Southern California Gas Company, then presented a carefully prepared paper on "Why the Three Kinds of Costs Should Be Separately Recorded," dealing mainly with the recording of capital investment in plant. The costs referred to were given as general construction costs, direct base costs and indirect base costs, and Mr. Hornby pointed out that such segregation had been made necessary by the "coming of public regulation and the establishing of the principle of permitting the utility to earn a reasonable rate of return upon the fair value of the property," necessitating the keeping of proper records for the determination of such fair value. Various items of cost and expense were defined in detail and numerous quotations from court opinions and utility associations were given to emphasize or explain points in the discussion.

The meeting then was adjourned for luncheon which was attended by 67, prominent among them being S. Waldo Coleman, president, Coast Counties Gas & Electric Company, and president of the Pacific Coast Electrical Association; William Baurhyte, president, Los Angeles Gas & Electric Corporation and past president of the association; A. B. Day, executive vice-president and general manager of the same corporation, and W. E. Houghton, its vice-president and treasurer. Reynold E. Blight, C.P.A., spoke on "The Accountant as a Business Builder."

The afternoon session was opened with the introduction of S. Waldo Coleman, who cited some interesting figures to show the growth of the industry. He stated that the biggest factor making for success is the co-operation of departments and pointed out that accountants as fact-givers can aid greatly toward removing possible causes of friction due to misunderstanding.

Followed the reading of a paper prepared by J. M. Bourus, San Diego Consolidated Gas & Electric Company, in which were discussed the responsibilities of the purchasing, stores and stores accounting departments in accounting for materials. P. R. Ferguson, The Southern Sierras Power Company, read correspondence between W. J. Meyers, chairman of the committee on classification of accounts, N.E.L.A., and American Gas Association and J. H. Lobban, Detroit Edison Company, a member of the N.E.L.A. committee, relative to the revision of both the classification of accounts and the standard annual report forms. The success of the stub system of handling customers' accounts as recently installed in the Pasadena office of the Southern California Edison Company, was reported on by R. H. Brown of that company, who stated that two Burroughs machines were handling the accounts for Pasadena, Alhambra and Monrovia, totaling about 25,000 bills a month, and that the company had decided to use the stub plan in all of its districts. It was pointed out that one of the great advantages of the stub system was the possibility of mailing bills promptly to customers.

Mr. Johnson in closing the meeting, thanked those who had been instrumental in making it a success and emphasized the importance of a large attendance at the convention at Santa Cruz in June.

Good Attendance Proves Interest in Metermen's Courses

Good enrollment in the annual short courses for metermen given recently at the University of Arizona, Tucson, the California Institute of Technology, Pasadena, and the University of California, Berkeley, proves the interest in this work, which is under the auspices of the meter committee of the Technical Section, P.C.E.A. The aim of the course is to afford metermen an opportunity not only to make broadening contacts but also to keep abreast of developments in meters and meter applications. Forty-three men attended the lectures at the University of Arizona, Tucson, under Professors James C. Clark and W. M. Kellogg. One-fourth of those in attendance were electrical men from the large copper-producing organizations of the state, the rest consisting largely of central-station men and manufacturers' sales representatives. This was the fourth annual course given by the Arizona university, as was the course given by the University of California, Berkeley, where thirty-two were in attendance. At Pasadena where the course was given for the second time there was an enrollment of forty men from eleven different organizations.

At Pasadena the course consisted of lectures, demonstrations, classroom discussion, meter test practices and laboratory experiments. An effort was made to cover the technical requirements of electric metering, the theory of operation, methods of testing and maintaining of electric meters, and information was given concerning the latest types of meters and metering devices. Students were divided into two groups, fourteen men registering for the elementary course and twenty-six for the advanced course.

Prof. R. W. Sorensen, head of the Electrical Engineering Department of the California Institute of Technology, was in charge of the instruction and was ably assisted by four other members of the college staff. Additional instruction was given by W. T. Chapman, meter engineer for the General Electric Company at West Lynn, Mass.; L. E. Emerich, general division manager from the Leeds & Northrup factory in Philadelphia; H. E. Fuqua, General Electric Company; W. F. Grimes, Westinghouse Electric & Manufacturing Company; A. F. Blecksmith, Duncan Electric Company; J. H. Vivian and L. L. Conrad of the Southern California Edison Company, all of Los Angeles.

At Berkeley the course was in charge of Professors T. C. McFarland and W. H. Austin, both of the department of electrical engineering, and was run in two parallel divisions. A Division was given over to men attending the course for the first time, and B Division covered advance theory and practice for men attending for the second time.

A. J. Hall, of the Ontario Power Company, Ontario, Calif., is chairman of the meter committee.

Many Interesting Features on Program for P.C.E.A. Convention

The program for the P.C.E.A. convention to be held at the Casa del Rey, Santa Cruz, June 14-17, as announced by R. R. Cowles, chairman of the program committee, follows:

Tuesday, June 14

8:00 to 10:00 a.m. Registration.
10:00 a.m. to 12:00 m. Address of welcome by Hon. W. O. Kerrick, Mayor of the City of Santa Cruz.
Report of President, S. Waldo Coleman.
Report of Treasurer, James F. Pollard.
Report of Secretary, Samuel H. Taylor.
Report of nominating committee.
Election of officers.
Announcement of section chairmen.
12:00 m. Luncheon, Casino ballroom, under the direction of the Advertising-Publicity Section, Richard E. Smith presiding. (Community singing.)
Final contest of three-minute speakers.

Engineering Section—J. G. Rollow, chairman

2:00 p.m. Report of section chairman.
2:20 p.m. Report of accident prevention committee, M. S. Slaughter, chairman.
"Accident Prevention," F. B. Lewis.
Discussion.
3:00 p.m. Report of electrical apparatus committee, H. A. Laidlaw, chairman.
"Relation of the Utility to the User from the Viewpoint of of the Consulting Engineer," L. F. Leurey.
3:40 p.m. Report of hydraulic power committee, J. M. Gaylord, chairman.
"Characteristic Features of Present-Art Hydraulic Turbine Designs," Arnold Pfau, consulting engineer, Allis-Chalmers Company.
4:30 p.m. Report of inductive co-ordination committee, L. J. Corbett, chairman.
"Co-ordination of Headquarters Engineering Staff with the Geographic Division Committees," Major H. S. Bennion, Director of Engineering, N.E.L.A.
5:15 p.m. Adjournment.

Commercial Section—H. K. Griffin, chairman

2:00 p.m. Report of section chairman.
2:20 p.m. Report of organization committee, J. F. Pollard.
2:35 p.m. Report of customer relations committee, W. P. Graef.
2:50 p.m. Reading of prize-winning essay by the winner.
3:00 p.m. Report of domestic range committee, P. P. Pine.
3:15 p.m. Report of air heating committee, E. A. Wilcox.
3:30 p.m. Report of general merchandising committee, H. C. Goldrick.
3:45 p.m. Report of refrigeration committee, Gardner Buss.
4:00 p.m. "Successful Electrical Merchandising Through Existing Retail Outlets," H. H. Courtright.
5:00 p.m. Adjournment.

Advertising-Publicity Section—Richard E. Smith, chairman

2:00 p.m. Report of Section chairman.
Report of Section executive committee, E. P. Ramsay, secretary.
Report of standards committee, W. A. Cyr, chairman.
Report of information committee, F. S. Myrtle, chairman.
Report of advisory advertising committee to the Public Relations Section, F. Z. Stone, chairman.
Report on co-operative advertising of California Electrical Bureau, Victor W. Hartley.
Address: "Publicity, Advertising and Public Relations," K. L. Hamman, president Johnston-Ayres Company, San Francisco.
Discussion.

Purchasing and Stores Section—C. D. Weiss, chairman

2:00 p.m. "Purchasing," S. Craig Alexander, assistant purchasing agent, California Hawaiian Sugar Refining Corporation.
2:45 p.m. "Storekeeping," A. S. McKelligon, general storekeeper, Southern Pacific Company.
3:30 p.m. General discussion.
5:00 p.m. Adjournment.

Insurance Section—Herbert Dewes, chairman

2:30 p.m. Report of section chairman.
Discussion.
4:30 p.m. Adjournment.

Entertainment

2:30 to 5:30 p.m. Bridge tea for ladies, lobby of Casa del Rey.
9:00 p.m. Reception to president, executive officers and guests of the association.
9:30 p.m. Dancing and entertainment.

Wednesday, June 15

General Session

9:30 a.m. "Light, Power and Progress," Clyde L. Chamblin, president, Association of Electragists, International.
10:00 a.m. "The Relation of Steam to Water Power," A. H. Markwart.
10:30 a.m. Illustrated talk—"Commercial Development in California," H. K. Griffin.
11:00 a.m. "Economic Development of Water and Power by Co-operation," Hon. John Hancock, attorney-at-law, Stockton, Calif.
11:30 a.m. "The Baum Principle of Power Transmission," Charles L. Fortescue, Westinghouse Electric & Manufacturing Company.
12:00 m. Adjournment.
12:15 p.m. Luncheon under the auspices of the Advertising-Publicity Section, Richard E. Smith presiding.
Address, "Selling Your Job," Ray Turnbull.
12:15 p.m. Luncheon meeting for members of the women's committee, Miss J. Frances Emans presiding.

Engineering Section—J. G. Rollow, chairman

2:00 p.m. Report of meter committee, A. J. Hall, chairman.
Discussion.
2:20 p.m. Report of overhead systems committee, C. E. Young, chairman.
"The Development of Porcelain Insulators," S. L. Case.
Discussion, led by J. P. Jollyman.
3:20 p.m. Report of prime movers committee, C. W. Wiggins, chairman.
Discussion.
3:40 p.m. Report of safety rules committee, E. J. Crawford, chairman.
"Electrical Inspection and the Inspector," George E. Kimball, electrical engineer, Industrial Accident Commission.
Discussion.
4:20 p.m. Report of underground systems committee, N. B. Hinson, chairman.
"Paper Cable Manufacture as an Engineering Problem," Dr. Robert J. Wiseman, research engineer, The Okonite Company.
Discussion.
5:00 p.m. Adjournment.

Commercial Section—H. K. Griffin, chairman

2:00 p.m. Report of lighting bureau, Clark Baker.
2:15 p.m. Report of agricultural committee, A. M. Frost.
2:30 p.m. Report of industrial heating committee, E. J. Cipperly.
2:45 p.m. Report of commercial cooking committee, J. W. Wrenn.
3:00 p.m. Report of transportation committee, K. I. Dazey.
3:15 p.m. Report of competitive power committee, W. C. Schafer.
3:30 p.m. "Gas for Cooking" Competition, J. F. Pollard.
3:45 p.m. Address (speaker and subject to be announced).
4:15 p.m. Joint session with Advertising-Publicity Section, "The Place of Advertising in Commercial Work," Al C. Joy.
4:45 p.m. Discussion.
5:00 p.m. Adjournment.

Accounting Section—H. W. Johnson, chairman

2:00 p.m. Report of chairman.
2:15 p.m. "Taxation," M. D. Lack, former secretary, State Board of Equalization.
2:45 p.m. "Accounting for Surplus," W. C. Funkhouser, California Railroad Commission.
3:15 p.m. "Control of Accounts," Prof. Howard S. Noble, Department of Economics, University of California, Southern Branch.
3:45 p.m. General discussion.
4:30 p.m. Adjournment.

Women's Committee of Public Relations Section, Miss J. Frances Emans, chairman

2:30 p.m. (To be announced.)

Purchasing and Stores Section, C. D. Weiss, chairman

2:00 p.m. Reading of paper, "Material Control."
Discussion.
3:00 to 4:30 p.m. Joint meeting with Transportation Section.

Transportation Section—S. B. Shaw, chairman

2:30 p.m. Report of section chairman.
3:00 p.m. Report of committee on records and accounting, J. S. Moulton.
3:30 p.m. Report of committee on special problems, J. M. Wainscoat.
4:00 p.m. "Tendencies of the Future," P. H. Ducker.
4:30 p.m. Adjournment.
(Note that the Purchasing and Stores Section will join the Transportation Section from 3 to 4:30 p.m.)

Entertainment

2:00 to 4:00 p.m. Music in lobby of Casa del Rey.
9:00 p.m. Dancing and musical numbers, Casino ballroom.
2:00 p.m. Ladies' motor trip to Big Trees. Tea served at Brookdale Lodge.

Thursday, June 16

General Session

9:30 a.m. "Management and the Accounting Department—A Changing Relation," Lewis Lilly, certified public accountant, McLaren, Goode & Company.
10:00 a.m. "The Place of Advertising in the Electrical Business," Dr. Paul F. Cadman, Associate Professor of Economics, University of California.
10:30 a.m. "Education in the Interest of Better Lighting," Clark Baker.
11:15 a.m. Address by H. T. Sands, president, National Electric Light Association.
11:45 a.m. Adjournment.

Sports

There will be no afternoon business sessions, the afternoon being devoted to sports and other forms of entertainment. For details refer to supplemental sports program.

Entertainment

2:00 to 4:00 p.m. Music in the lobby of the Casa del Rey.
12:00 m. Luncheon for ladies, Santa Cruz Country Club.
Afternoon—Bridge or golf.
9:00 p.m. Dancing and specialty numbers, Casino ballroom.

Friday, June 17

General Session—Under the auspices of Public Relations Section, A. B. West, chairman.
9:30 a.m. Report of committee on president's report.
Report of committee on resolutions.
9:45 a.m. "Applied Public Relations," W. S. Vivian, director of public relations, Midwest Utilities Company.
10:15 a.m. Report of women's committee of Public Relations Section, Miss J. Frances Emans.
Address—Miss Isabell Davie, N.E.L.A. headquarters.
Discussion.
11:15 a.m. "The Development of California Through Its Club Women," Dr. Mariana Bertola, president and director, California Federation of Women's Clubs.
12:00 m. Adjournment.
12:10 p.m. Convention photograph.
General Session—Development and industrial conference under the auspices of the Public Policy Section, R. H. Ballard, chairman.
2:00 p.m. "The Progress of Electric Utilities Under Regulation," Hon. Leon O. Whitsell, commissioner, California Railroad Commission.
"The Relation of Electricity to Agriculture," Earle Houghton, president, California Farm Bureau.
"The Relation of Electricity to Industry," Robert I. Bentley, president, California Packing Corporation.
"The National Electric Light Association—A Story of Co-operative Progress," Paul S. Clapp, managing director, N.E.L.A.

Entertainment

2:00 to 4:00 p.m. Music in the lobby of the Casa del Rey.
2:30 p.m. Speed boat party for ladies, Santa Cruz Bay.
Bridge for ladies, lobby of Casa del Rey.
6:45 p.m. Annual banquet, Casino ballroom, S. Waldo Coleman presiding.
10:00 p.m. Dancing and specialty numbers.

Contractors, Dealers and Inspectors

Team-work of Industry Pledged Anew at Southern Electragists' Lebec Meeting

LOOKING back over the brief space since the annual convention of the California Electragists, Southern Division, held at Hotel Lebec on the Ridge route between Los Angeles and Bakersfield, April 23, the events which took place that day seem to have worn a particularly significant aspect. Or it is that since the convention the effects of its deliberations have been so far-reaching that in retrospect the convention itself has assumed importance which to the participant it did not seem to possess.

Yet the one-day meeting evidently held within itself a potential power which, released by the more complete understanding which resulted as a consequence of it, has already materially changed industry relationships in southern California and promises to carry on to still further mutual advantages.

It was by no means, as must be seen from a review of its transactions, "just another convention."

Harry Walker, vice-president of the California Electragists and chairman of the Southern Division, opened the convention session Saturday morning. In the old days, he said, contractors' conventions were occasions at which contractors got together to "pan" the other branches of the industry. This procedure did not get them or anyone else anywhere. The conventions of the Electragists today, he said, result in getting the industry together to discuss in a friendly way matters of mutual concern.

Mr. Walker read a telegram from Clyde Chamblin, president of the Association of Electragists, International. Mr. Chamblin was unable to be present at the meeting but sent his best wishes and his pledge of support.

Range of Possibilities for Contractor

The first speaker announced was Bert Cramer, Listenwalter & Gough. Mr. Cramer spoke on "The Possibilities of Market Development of Electric Ranges." He began by reviewing the progress of electric range selling, crediting the power companies with bearing the major burden during pioneer years. With the coming of a more general acceptance of electric ranges, greater possibilities for sales are opened up to the electrical dealer and contractor. Some of the difficulties which had hindered range selling previously, he said, were being overcome. Ranges now cook more quickly; they have greater eye appeal. In the past they had been too technically sold, arousing a fear that their operation was complicated. Not enough facts had been brought out to show that in operation an electric range is really economical. The greatest difficulty, he said, was to be found in the fact that the electrical fraternity itself was not able to state from its own experience at home just what the electric range would do because not enough electrical people were using the range themselves.

A large poster, carrying the keynote message of Clyde Chamblin and a picture of the new president of the A.E.I., was displayed in the hotel lobby during the convention.

As the best selling plan he advocated that a contractor-dealer specify a definite time each day or a day each week to be devoted strictly to selling electric ranges if he could not hire a salesman to devote full time to selling. He then called upon Harry Lippert of the Lindemann & Hoverson Company to give examples of contractors who have been successful selling electric ranges.

Mr. Lippert told of a man who had formerly worked for a power company and who had left that company to specialize in range selling. He had sold 150 or more ranges in one year and now had two men working for him. In another community, three contractors doing wiring exclusively got together and persuaded the hardware dealer to display and sell electric ranges, dividing the wiring for them between the three contractors, the contractors themselves turning in the prospects to the hardware man who gave them a commission on such prospects converted into sales. In seven months 33 ranges had been sold and one contractor decided to take up the selling of ranges himself. Another case was cited of a contractor who had signed up a complete extension which a power company was making, selling 14 ranges and giving the power company a larger connected load, everyone being happy over the outcome. Another instance was cited wherein a dealer allowed a demonstrator for a brand of shortening the use of an electric range in order to hold demonstrations in his store. In this way a number of prospects were obtained and in seven weeks he had sold seven ranges. Another contractor, he said, built a demonstrating kitchen in which every Saturday afternoon a local woman, well known to the community, was asked to give a demonstration of cooking. A power company representative was asked to be present to advise as to the operating cost of the range.

Mr. Lippert concluded by pointing out that the power companies in the south had just closed their electric range campaigns and were planning to devote the summer perior to selling refrigeration. He advised that now was the ideal time for contractors to follow up the power company's range campaign with a

The "wild birds" Electragist team which won the pennant and the responsibility of fostering industry team-work during the next year.

"Wild flower" team, representing the other branches of the industry —jobber and manufacturer—which put up a gallant battle.

range-selling campaign of their own and to be so lined up that when range campaigns are resumed in the fall, contractors and power companies might better work together to sell more ranges.

Don Heumphreus, contractor of Santa Barbara, added conviction to the message by reading a list of his own electric bills for his completely electrified home, using electric heating, range, water heater and a good lighting load. It was announced also that the Bureau of Power & Light, Los Angeles, intends to put four men into the field to assist in the selling of electric ranges through contractors.

C. J. Geisbush, state manager, then read a report from the Los Angeles Gas & Electric Corporation, giving cooking rates and describing how one customer who had previously been using a large quantity of lighting had had installed a water heater just to get the combination rate. Thus on this new schedule he was getting his water heating for nothing since with the new rate there was no increase over the previous cost for lighting alone.

George Rankin, formerly field representative of the California Electrical Bureau for the San Joaquin Valley district, was then announced as the new representative of the bureau for the Los Angeles district to succeed Wm. Brainard. Mr. Rankin gave a breezy and amusing talk, peppering it with the thought that Red Seal activity in his district has been a direct reflection of the efforts being made by the power company representatives and that only 10 per cent of the results could be traced to efforts of contractor-dealers. He urged that the contractors try to raise this percentage.

Present Architects' Guide

In introducing W. L. Hyde, of George L. Patterson Company, chairman of the estimating section, Mr. Walker spoke of the progress made by that section. At first, he said, suspicion had to be overcome. Estimators attended the meetings feeling that their own shops had secrets which they must guard jealously. That idea, he said, was now passe.

Mr. Hyde made a detailed report of the activities of the estimating section. The first twelve months of its existence, he said, had been devoted to building up a feeling of friendliness and to breaking down the attitude of suspicion mentioned by Mr. Walker. The attendance at meetings, he said, averages about 21.

A more constructive program, he said, had been thought necessary and the section had been organized along stronger lines. Several branches had been developed, each one non-interfering with the others, the line of demarkation between the active committees being clearly drawn.

Among the accomplishments of the section he listed the drawing up in complete form of a standard specification form or guide which was being placed in the hands of architects. Indications would lead to the expectation that these guides would be used by the architects of southern California quite extensively in the writing up of specifications. Non-commercial in character and designed solely as a guide to the writing of specifications which would be clear and sufficiently complete in detail to make possible more complete estimates, the guide would aid in cutting down the overhead and time necessary to estimate a job; make for greater uniformity in estimates because there would be less guessing as to just what the architects meant; bring about a closer co-operation between architects and engineers and develop a better understanding among them.

The estimating section, he said, had designed a small emblem, stressing the ideal of accuracy, which is to be used by contracting companies and individuals, who are members of the estimating section. Data and data service to members had been worked out by the data committee. A night class is being contemplated for the study of mathematics and the use of the slide rule.

In summing up the work of the section, Mr. Hyde very modestly stated that there was nothing new in the scheme but that it had been an adaptation of old ideas to present purposes; that it was a plan which could be worked elsewhere in almost any locality; and that any contrating association could establish an organization of a similar nature.

The Symbolical Ball Game

Just before adjournment for noon and the baseball game, Hobart Barnes, assistant secretary, Southern Division, displayed a large pennant. The pennant

Billy Knost, captain of the "wild flowers", congratulates R. F. Doll, captain of the "wild birds", upon winning the pennant.

was to be regarded as a symbol, he said. On it were lettered the words "Industry Team-work." The competition in the baseball game between the Electragists and the team representing the other branches of the industry would typify a struggle for the privilege of leading the other branches of the industry in the work for greater inter-industry co-operation.

A thrilling game of baseball was played out on the front lawn between the Electragists' team, captained by R. F. Doll, Glendale, and the Industries' team, captained by Billy Knost. Jim Riley of the Graybar Electric Company was the umpire. The Electragists' team won the pennant and with it the privilege and responsibility of leadership in industry team-work.

Edison Policy Explained

Trade relationship might be said to have been the theme of the afternoon sessions. W. L. Frost, general commercial manager, Southern California Edison Company, was the first speaker. He began by reciting Clyde Chamblin's inaugural message to the A.E.I., emphasizing the term "co-operation within the industry."

"Our jobs and businesses in all of their ramifications are not 'I' jobs; they are 'we' jobs," said Mr. Frost. He detailed how each branch of the industry was needed to do a complete work.

He paid a tribute to the trade publications for their work in co-ordinating the activities of the various branches. Without the Electragists as a part of the industry, he said, the industry would be like a wagon with only three wheels.

Mr. Frost then went on to describe the program contemplated by the Southern California Edison Company and to tell how it could be made of direct benefit to the contractors themselves. That company, he said, would spend during 1927 $80,000 to advertise the use of electricity and electrical devices, one-half of which would be spent in advertising the idea of using current-consuming devices, such as ranges, refrigerators, better lighting and appliances. Such advertisements, he said, would carry a line referring the reader to the Edison company or the local contractor or dealer. The 25 salesmen to be employed, he said, most of whom would be known as utility salesmen, would sell no merchandise. They would help the contractors to sell wiring and equipment; their sales would be made through local dealers. They would interest builders in better wiring, convenience outlets and Red Seal homes. The company is to advertise in 14 national magazines encouraging industries to locate in California. A number of special campaigns in which the dealers can co-operate will be conducted during the year. Seventeen cooking schools are being contemplated and all ranges sold by the company are to be sold at list price. The company expects to sell 2,500 electric ranges for which it will pay spot cash to the contractors for the wiring jobs. He said he did not think that the standard wiring plan advocated by the Electragists was practical as yet. Wiring ordinances and conditions differ too greatly. He urged, rather, that the Electragists study the local conditions and co-operate with local Edison district managers.

He then went on to show that merchandising activity by a central station always resulted in better merchandising conditions for all electrical outlets. As an example he spoke of the kitchen unit campaigns conducted recently by all power companies.

"Before the kitchen unit campaign, kitchens were equipped with cords, sockets, and 16-c.p. lamps or at best with a little flat reflector in the ceiling which cost, installed, about $1.50. In the first six months of 1925 three of the largest jobbers in California sold 3,900 kitchen units to dealers while in the last six months they sold 16,000 to dealers and 30,000 to the Pacific Gas and Electric Company. In 1926 they sold to dealers 27,500 and to the P. G. and E., 15,300. In these two years the P. G. and E. sold 43,300 and the dealers 47,400 kitchen units. In 1926 the dealers sold twice as many as the P. G. and E. and six times as many as were sold by dealers in the first six months of 1925, at which time the P. G. and E. were not selling kitchen units. I am sorry to say that mainly because of active opposition from contractors, our own kitchen lighting campaign was not a complete success for we sold only some 10,000. But I also believe that largely because of our somewhat feeble efforts,

dealers are now equipping many new homes with kitchen units.

"I wonder if we could not get together on some kind of fixture and kitchen-unit campaign for old houses. Perhaps everything we do does not suit everybody. That is hard to accomplish although I personally would like nothnig better. Perhaps after all any one Electragist only disagrees with us on one-half of one per cent of the things we do. If he agrees with us in the 99½ per cent, which I think is a fair assumption, would it be asking too much for him to forget for awhile the half of one per cent as time and a better understanding on both sides may correct the condition. In this connection, please do not misjudge the Edison company because of some overt act of a salesman. It is our plan to be strictly fair and ethical, and any of our managers will appreciate being informed of unethical treatment made by our salesmen."

His job, Mr. Frost said, was to sell 205,000 hp. additional connected load in 1927. He pointed out that the average home was very poorly electrified, and used only on an average of 1 kw. per day. He pointed out that there was plenty of business for everyone and a wonderful opportunity for all branches of the industry. In concluding he offered an invitation to every Electragist to become better acquainted with him personally and with his company and to come and discuss any possible differences with him or other representatives of the company to the mutual benefit of all parties.

T. A. Rowley of Pasadena commended Mr. Frost on his attitude and suggested that in the interests of better understanding among all branches efforts be made in the future to hold consultation with other branches of the industry when a program of such widespread importance is contemplated, in order that the other branches may understand and work with the power companies.

How the Jobber Assists

The inaugural message of Clyde Chamblin upon his election to the presidency of the Association of Electragists, International, was read by Mr. Geisbush. This was then followed by a paper prepared by H. T. Simmons, Graybar Electric Company, and C. H. Thrane, Pacific States Electric Company, and read by H. E. Rea of the latter company on "The Jobber and the Industry."

Mr. Rea stated that the place of the jobber in the industry is that of a distributor. The number of contacts which it would be necessary for the average contractor-dealer to make for the establishment of credit and to secure data and information as well as to furnish merchandise, he said, would be tremendous if it were not for the jobber. It would also be necessary for him to put in a considerable investment in merchandise. Nobody, he went on to say, is trying to force large stocks of merchandise on the hands of anybody else today.

One of the other important functions of the jobber is that he enables the manufacturer to devote his energies to manufacturing, to improving the quality of the article at a low price, eliminating extensive sales expense caused by multiple distribution. Another important factor, he said, was that the credit and service departments of the jobbing organizations accumulated information which was of value to the entire electrical fraternity. He commented on the paper, "Know Your Business—the Business Guide," written by the co-operative jobbers and credit men and presented at a former Electragist convention. He commended the Electric Clubs and other associations for the work they are doing, especially in co-operative movements, to educate the consuming public to expect and demand more electrical conveniences. The sales possibilities of the Red Seal electric home as against the average home, he said, should be analyzed, and the opportunity capitalized. The constructive work of the Electragists through their executive committee's efforts to co-ordinate the interests of jobber and contractor, was especially commended.

Northern Division Program

C. J. Geisbush then was called upon to give some details of the program contemplated by the state association

Pity Jim Riley, only a poor umpire in an industry slug fest for co-operation.

under his guidance in his new position as state manager.

The large territory to be covered by the northern division, he said, made it necessary to break up the territory into three districts, and in order to cover the districts, the California Electrical Bureau representatives and the Electragists' field representatives were to work in close harmony in order that the visits of each would be more frequently and better distributed. The program would be for the upbuilding of quality in membership and the promotion of harmony between the branches of the industry.

The Red Seal activity, he explained, was to be made an integral part of the duties of the power company representatives. No one branch of the industry, he said, unaided, could put over the Red Seal plan; it calls for the assistance of every electrical man.

He pointed out that a plan whereby Red Seal contractors could be certificated for a period of one year, certificates to be renewed each year provided the contractor continued to make Red Seal installations, a minimum of two Red Seal homes per year being required, was under contemplation. This would reduce to actual figures a selective group of producers on whom the greatest efforts could be directed. Further efforts, he said, were to be made to continue receiving reports from Electragists on monthly appliance sales in order to keep a record of the kilowatt hours put on power company lines by the membership.

Mr. Frost concluded by stating that a series of 16 meetings in northern California, starting at San Luis Obispo, going north to Corning and returning through the valley to Bakersfield, carrying the first lesson in estimating, would inaugurate the Northern Division activities.

Harry Beecher representing the electrical department of the City of Los Angeles was asked to comment on the inspectors' relationship to the Electragists. He read an editorial from the Electragists' magazine, speaking of the electrical inspector as the friend of the Electragists.

An attendance of over 125 jammed the hotel and taxed the accommodations available but because of the prevailing good nature and fellowship this only added to the general enjoyment of the occasion. Brown & Pengilly of Los Angeles ran a special bus from that city to the convention, all others arriving in machines. The Northern Division was represented by Eddie Martin, secretary of the state association, and Charlie Shipman, president of the San Francisco Electrical Contractors and Dealers Association.

Informal dancing provided the entertainment both Friday evening prior to the convention and Saturday evening following an informal banquet. The many ladies who attended the convention entertained themselves either by attendance at the sessions or by entering the bridge tournament conducted by Mrs. Harry Walker and Mrs. W. L. Frost. In this event Mrs. Frost won the first prize, Mrs. Don Heumphreus of Santa Barbara, the second prize, and Mrs. Will Barnes of Pasadena, the third prize. Under the editorship of Rollin Smith a typewritten "convention daily paper" called "The Elec-Lebec" was published.

Sacramento Contractors Elect Year's Officers

Officers for the year 1927 were elected recently by the Sacramento Electrical Contractors and Dealers Association. Carl Vining, Standard Electric Works, was named president of the association. Mr. Vining has been acting president since the resignation of Roland Finchley. Clifford Prudhomme was made vice-president, and Louis McGinnis was named secretary-treasurer.

The election meeting was the occasion of a visit from George Eldridge, field representative of the California Electragists, and Wm. A. Cyr, associate editor of Electrical West, who spoke on the Red Seal plan and the selling possibilities in the industry, respectively. The meeting was held at the electric home of George Foss, electrical contractor of Sacramento.

Frank E. Sherman recently sold out his interest in the **Sherman Electric Company** of Corning, Calif., to **R. E. McPherron, H. A. McPherron, J. C. Stalders** all of Corning, Iowa, and **J. H. Juchendbaugh** of Sydney, Iowa. The electric establishment is to be known as the **Corning Electric Company.**

King-Zonne Company, agent for Clark's electrically driven tools, and specialist in repairing all makes of electrically driven tools, has moved into its new and more spacious shop at 2226 South San Pedro Street, Los Angeles. The firm was formerly located at 2620 South San Pedro Street.

A. K. Seymour, formerly associated with **The Gay Engineering Company,** on its electrical staff, has opened a new electrical service store at 3425 South San Pedro Street, Los Angeles, under the name of **Seymour Electrical Service.**

State Code Sought in Act Now Before Washington Senate

A bill introduced in the Senate by Senator William Wray of King County, Wash., provides that all firms engaged in the business of conveying electric current in the state of Washington will be regulated under the provisions of the National Electrical Code approved by the American Engineering Standards Committee. An appropriation of $35,000 is requested to carry out the act. The state fire marshal would enforce its provisions.

Gans Bros. Electric Company, for many years located at 141 South Main Street, Los Angeles, has kept stride with the growth of the city toward the southwest by moving into new quarters at 1523 West Seventh Street, Los Angeles.

Home Electric Specialty Company, formerly at 610 South Olive Street, Los Angeles, has moved out into a new and attractive corner store at 3728 West Pico Street, Los Angeles, where a complete line of appliances is stocked and brought closer to the residential section.

The Empire Lighting Fixture Company has opened a large and attractive store in San Diego occupying three store frontages at 3138-3148 Fifth Street. In addition to the home office in Los Angeles they now have stores operating in Hollywood, Glendale, Pasadena and Long Beach.

The Enterprise Electric Company, recently of San Francisco, **Jack Williams,** owner, has opened a shop at 111 South Fourth Street, Walla Walla, Wash.

F. D. Weber, secretary, Northwest Association of Electrical Inspectors, Portland, was chosen a delegate from that association to attend a meeting to investigate into the possible formation of an international organization of electrical inspectors, held in New York City

A. A. Tobey, contractor of Portland, and F. D. Weber, secretary of the Northwest Inspectors, at the recent Oakland convention.

recently. While in the East he also attended the three-day meeting of the Electrical Committee of the National Fire Protection Association.

Mr. Weber announces that a few extra copies of the 1926 convention proceedings of the California Association of Electrical Inspectors and the Northwest Association of Electrical Inspectors, jointly, printed in one book, are available at his office, Box 745, Portland, Ore. Mr. Weber announces that these may be purchased at $3 per copy while they last.

J. F. McDill, electrical contractor of Dunsmuir, Calif., proprietor of the **Dunsmuir Electric Works,** was a recent visitor to San Francisco.

San Diego Electrical Contractors and Dealers, distributors, and members of the city electrical inspection department, held their annual banquet on April 1 with Wm. H. Talbott, superintendent, electric meter department of the San Diego Consolidated Gas & Electric Company, as toastmaster, and F. B. Nightingale, lighting specialist, General Electric Company, Los Angeles, speaker of the evening.

J. J. Agutter & Company, electrical contractors, for several years located at 1409 Fourth Avenue, Seattle, have moved to 316 Seneca Street. The firm has discontinued all merchandising and will specialize in electrical contracting. Recent awards secured by the concern include the Mount Baker Theater in Bellingham and the Milwaukee Hotel and railroad station being built at the Gallatin Gateway of Yellowstone Park.

Durham & Evans is the firm name of the new electrical contracting house opened in Montebello, Calif., by **A. L. Durham** and **M. P. Evans,** both of whom were formerly with the **K. D. Miller Company** of Whittier, Calif. The new store is at 305 Whittier Boulevard, Montebello, Calif.

The Queen City Electric Company of Denver, Colo., has the contract for electric wiring in the new Ballinger-Robinson Building on Welton Street between 17th and 18th Streets, Denver.

Paul Needham, Electragist, has moved into new and larger quarters at 137½ So. Beverly Drive, Beverly Hills, Calif. He was formerly at 116 Speedway Drive.

"This Is the House That Jack Built"

This is the House that Jack built, and, Oh boy!
'Twas Jack started out with his heart full of joy
For the house he would build would not be a toy
But one hundred per cent without alloy.

This is the Architect, meaning so well,
But who, for the life of him never could tell
Why the small wires installed for the front door-bell
Shouldn't do for all of the lights as well.

These are the Specifications. You know
They're copied from some written ages ago,
With nothing in detail and not much to show
Class of materials or where they should go.

This is the Contractor, "up to his neck"
Because he had erred in his figures, by heck,
And so could see naught but the mighty "kopec,"
And kept all his sub-bidders sadly in check.

This is the 'Lectrical Contractor (?), who
Cut all of the other bids more than in two.
His sole place of business he kept in his shoe,
So he did a "bum" job and straightway he "flew."

[With amplifications, modifications and diversifications. All illustrations have been deleted, censored and otherwise obliterated.]

Claude Mitchell, the poet himself, in company with the rest of the underwriters, L. S. Bush, engineer, San Francisco, and James M. Evans, engineer, Los Angeles.

This is the Owner, who puts up the "dough;"
He'll owe for the bungle in his bugalow.
For trusting to others what he did not know
He's mad and he's peeved. Shouldn't he be so?

This is the Inspector; the Goat is he!
He condemned the job, 'cause it's bad as can be.
The Architect, Contractor, Owner, all three
Blame him for their "grief"—in this they agree.

This is the Code. 'Tis the Inspector's guide
To which all the rules in his ord'nance are tried.
His reply to others, though they seek his hide,
"Inspectors have ruled **the Code shall decide.**"

This is the Conference, held as a last
Resort to see why the job can't be passed—
The Architect, Contractor, Owner all massed
Against the Inspector lashed to the mast.

This is the Decision. After a deal
Of argument about the Inspector's appeal
For proper construction, the Owner can feel
There's naught will do him but a job "Red Seal."

This is the Outcome:—The Architect learned
He needed new "Specs," and the Contractor spurned
"Fly-by-night" wiremen while the Owner discerned
The electrical aids for which his wife yearned.

This is the House that Jack built! Let it be
A lesson to all who would build that they see
Contractors of standing and integrity
Install all the work for electricity.

—C. W. Mitchell.

Meetings

Westinghouse Agent-Jobbers in Annual Convention

The annual convention of the Westinghouse Agent-Jobbers' Association was held at Del Monte May 23-27. All of the sessions were closed except that held Friday evening, May 23, when guests were invited and an interesting program was presented by men prominent in the electrical industry.

The speakers included S. Waldo Coleman, president, Coast Counties Gas & Electric Company, and president, Pacific Coast Electrical Association, who spoke on "Public Utility Merchandising"; Albert H. Elliot, secretary, Pacific Division, Electrical Supply Jobbers Association, whose subject was "The

SAMUEL A. CHASE

Spirit of an Association"; Clyde L. Chamblin, president, Association of Electragists, International, who talked on "A Friendly Industry"; and John J. Jackson, counsel for the Westinghouse Agent-Jobbers' Association, who chose as his topic, "Station W.A.-J.A.—Bad Times Stories." A paper by Charles T. Hutchinson, president, McGraw-Hill Company of California, in the absence of Mr. Hutchinson was read by George C. Tenney, managing editor, Electrical West.

These men, whose work brings them in close contact with the various phases of the industry and its problems, brought out many important points tending toward the solution of some of those problems and made valuable suggestions in connection with the achievement of still closer co-operation between the different branches of the electrical industry.

One of the most pleasing features of the Friday evening meeting was the presentation of a gold watch to Samuel A. Chase. The watch bore the inscription, "The Jobbers' Friend," and Mr. Jackson, who made the presentation on behalf of the association's membership, paid high tribute to Mr. Chase's services to the organization. Mr. Chase, who was chairman of arrangements, was genuinely surprised at this unexpected feature of the program and greatly pleased and touched by the gift.

At the election held on Saturday the following officers were chosen for the ensuing year: president—Walter Williamson, New York City; vice-president—J. S. Tritle, Mansfield, Ohio; secretary—W. I. Bickford, Pittsburgh; assistant secretary and treasurer—H. T. Pritchard, Mansfield; counsel—John J. Jackson, Pittsburgh.

Sacramento Valley Society Holds Two Interesting Meetings

Two meetings of especial interest recently were held by the Sacramento Valley Electrical Society, Sacramento, Calif.

One of these was an evening spent at the University Farm at Davis, where an inspection trip was made through the new agricultural engineering building. The program was furnished by the Division of Agricultural Engineering of the University Farm and included addresses by prominent members of the faculty, singing by the Agricultural Engineering Quartet and a boxing exhibition. The second gathering was a "Joy" meeting, so called because Al C. Joy, advertising manager for the San Joaquin Light & Power Corporation, Fresno, and the Great Western Power Company, San Francisco, was the principal speaker. Musical numbers added to the enjoyment of the evening.

Commercial and Public Relations Discussed by Managers

Commercial and public relations topics consumed a major portion of the two-day program of the annual meeting of the district managers and department heads of the Pacific Power & Light Company, Portland, held in April at the Columbia Gorge Hotel, Hood River, Ore. Talks were given by Guy W. Talbot, president; L. A. McArthur, vice-president and general manager; C. W. Platt, secretary and treasurer; George C. Sawyer, sales manager; W. T. Neill, superintendent of rates and service; Henry S. Gray, attorney, and V. H. Moon, appliance sales superintendent. Other departments likewise were heard from, and many district managers discussed pertinent subjects. Invited guests on the program included L. J. Smith, professor of agricultural engineering, Washington State College, Pullman, Wash., who talked on rural electrification, and Marguerite Butler, Portland Electric Power Company, Portland, who told of the work of the Women's Committee in the Northwest.

A feature of this year's meeting was the first annual handicap golf tournament for the Pacific Power & Light Company trophy. The sessions were adjourned each day at 3 p.m. so that this tournament could be completed. It was won this year by Roy Skill, district manager at Dayton, Wash.

Two Important Meetings to Be Held in St. Paul.—The annual meeting of the National Committee on the Relation of Electricity to Agriculture will be held June 20-21 at the St. Paul Hotel, St. Paul, Minn. At the same hotel June 22-25 the annual convention of the American Society of Agricultural Engineers will be held.

Coming Events

American Institute of Electrical Engineers.—Pacific Coast convention at Hotel Del Monte, Del Monte, Calif., Sept. 13-16.

American Society of Agricultural Engineers.—Annual convention at St. Paul Hotel, St. Paul, Minn., June 22-25.

Artistic Lighting Equipment Association.—Midsummer convention at Ambassador Hotel, Atlantic City, N. J., June 22-25.

Association of Electragists, International.—Annual convention at Hotel Chase, St. Louis, Mo., Aug. 8.

National Committee on Relation of Electricity to Agriculture.—Annual meeting at St. Paul Hotel, St. Paul, Minn., June 20-21.

National Electric Light Association—Annual Convention, Atlantic City, N. J., June 4-10.

Northwest Electric Light and Power Association.—Annual Convention, Salt Lake City, Utah, June 21-24.

Pacific Coast Electrical Association.—Annual Convention, Casa del Rey, Santa Cruz, Calif., June 14-17.

Rocky Mountain Division, N.E.L.A.—Colorado Public Service Association.—Joint annual convention at Colorado Springs, Colo., Oct. 17-20.

Some of those who attended the annual meeting of the district managers and department heads of the Pacific Power & Light Company, Portland, Held at Hood River, Oregon.

Good Attendance at Meeting of Colorado Electrical Men

The second state-wide meeting of Colorado electrical men was held in Denver April 22. The meeting was sponsored and arranged by the Electrical League of Colorado, Denver, and was brought about through the industry's efforts, particularly during the past two years, to work out a coordinated program for the development of the industry in that territory. The attendance reached 160, of which there were 52 contractors, 48 manufacturers, 37 jobbers and 23 central-station men. The response of contractors was particularly gratifying to league officials, this division having again led in attendance with 22 registering from points outside of Denver.

The meeting started with registrations at 9 a.m. Friday and continued through the day, ending with a banquet at night. The Denver Electrical Contractors Association was host to all visiting contractors at a noon-day luncheon. Problems of particular interest to contractor-dealers were discussed at that time, and the activities of the Colorado-Wyoming Electrical Contractors and Dealers Association also were given consideration. All officers of this association, which came into existence during the 1926 meeting, held over for another term.

F. F. McCammon, league chairman, delivered the opening address and presided during all business sessions and at the evening banquet. Papers covering every phase of electrical and utility association activity in the Mountain region included those by G. E. Lewis of the Rocky Mountain Committee on Public Utility Information; R. B. Bonney, educational director, Mountain States Telephone and Telegraph Company; K. A. McIntyre, of The Society for Electrical Development and C. T. Hutchinson, president of the McGraw-Hill Company of California. Messrs. McIntyre and Hutchinson found it impossible to attend the meeting in person but their papers were read by the presiding chairman.

G. B. Buck, chairman of the Commercial Section, N.E.L.A., was the principal speaker during the morning session. His subject was "Opportunity for Commercial Development in the Rocky Mountain Region." The necessity for higher wiring standards and improved inspection was discussed by representatives of the underwriters and city inspection departments. A review of the credit situation was given by C. M. Reed, general manager, Denver Retail Credit Men's Association. George Bakewell, Jr., in his talk, "Informing the Public," brought out the obvious necessity for every branch of the industry to put its shoulder to the Red Seal wheel in order to combat the inadequate wiring evil which results in the retardation of electrical progress. An announcement was made regarding the proposed extension of Red Seal activity to include the entire state.

Round-table discussions were led by P. Harry Byrne, president of the Contractor-Dealers' Association, and E. C. Headrick, Mountain States executive committeeman, Association of Electragists, International. A surprise feature of the entertainment program during the banquet was a skit devoted to the Red Seal Plan of wiring.

J. J. Cooper was chairman of the committee which arranged the one-day meeting.

Red Seal Topic of California Bureau Advisory Committee

The Red Seal Plan was the principal topic of discussion at a recent meeting of the advisory committee of the California Electrical Bureau held in San Francisco. The secretary reported upon the progress of the plan and directed attention to the new application forms, specification sheets and wiring plans now being distributed. He also stated that the advertising committee had in course of preparation the sales and advertising manual authorized by the advisory committee at its last meeting. It was reported that Red Seal letterheads had been printed in quantities sufficient to furnish a supply to each district chairman so that in the future all Red Seal correspondence may be written upon appropriate letterheads.

H. H. Courtright, of the Valley Electrical Supply Company, Fresno, stated that in the San Joaquin Valley the Red Seal activities last year had been responsible for a marked increase in electrical installations, even in homes that did not conform eventually to Red Seal standards. In the belief that the same condition prevailed throughout the entire state he suggested that surveys be made showing, wherever possible, what this increase was.

Books & Bulletins

ELECTRIC WATER HEATERS FOR POULTRY

By George W. Kable, project supervisor, Oregon Committee on the Relation of Electricity to Agriculture, and F. E. Fox, Oregon State Agricultural College Experiment Station. Published by Oregon Agricultural College Experiment Station, Corvallis, Ore., Station Circular 81.

In response to a number of requests from Oregon poultrymen as to the effect of warming drinking water in laying houses during cold weather, the Oregon Committee on the Relation of Electricity to Agriculture, co-operating with the experiment station of the O.A.C., made an investigation of the subject with particular reference to the feasibility of using electricity as the heating agent. This bulletin records the results of that investigation. It was found that pullets drank 25.4 per cent more warmed water than cold during freezing weather and that water consumption per 100 eggs laid was increased, but no definite conclusion is drawn as to the effect of this increased consumption on egg production.

The major portion of the bulletin describes, pictures, and tabulates the results of tests on several different kinds and types of electric water heaters. Immersion and clamp-on heaters of standard manufacture were tested, as were makeshift devices constructed from percolator heating units, soldering irons and incandescent lamps. Comparative costs are tabulated and suggestions are made as to the wattage requirements for different volumes of water to be kept warm under varying temperatures. The book contains valuable data from which a poultryman may determine the kind of electric heater installation he needs to meet the conditions under which he operates.

CENTRIFUGAL FANS—PERFORMING CHARACTERISTICS AND METHODS OF TESTING.—Bulletin of the University of Washington Experiment Station prepared by G. S. Wilson, professor of mechanical engineering, W. L. Dudley, vice-president and chief engineer of the Western Blower Company, Seattle, and H. J. McIntyre, assistant professor of mechanical engineering. This profusely illustrated 39-page booklet gives detailed results of many experiments. It should be of service to those interested in centrifugal fans and should assist materially in the selection of proper equipment for any particular job. This booklet is known as Bulletin No. 34, and it may be obtained from the Director of the Engineering Experiment Station, University of Washington, Seattle, at 30 cents a copy.

ELECTRICAL MEASURING INSTRUMENTS.—Section No. 33 of the A.I.E.E. standards. This new section of the Institute standards was completed recently and became effective April 1, 1927. Electrical indicating instruments for a.c. and d.c. service are covered; ammeters, voltmeters, wattmeters, reactive volt-ampere meters, frequency meters, power factor and phase-angle meters, and synchroscopes.

Fifty-two contractors, 48 manufacturers, 37 jobbers and 23 central-station men attended the second state-wide meeting of Colorado electrical men.

Personals

Gaylord B. Buck, for the past eighteen years associated with various properties of the Henry L. Doherty organization, has been named general new business manager of the Public Service Company of Colorado with headquarters in Denver. He succeeds **Charles A. Semrad**, recently promoted to the position of vice-president and general manager of the St. Joseph Railway, Light, Heat & Power Company. Mr. Buck was born in Mt. Vernon, Ill., where he received his preliminary and high school education. From 1909 until 1914 he was in the employ of the Citizens' Gas, Electric & Heating Company, Mount Vernon, starting as a trouble shooter and advancing through all departments until his appointment as new business manager of the company. In 1914 he was transferred to the City Light & Water Company, Amarillo, Tex., serving in the capacity of new business manager until June, 1917, when he was made new business manager of the Durham Traction Company in Durham, N. C. In 1924 Mr. Buck was transferred to the Doherty property in Denver and was placed in charge of the new business department, electric division, a position which he has held until his recent promotion. As general new business manager Mr. Buck will have complete supervision of sales in the Public Service

GAYLORD B. BUCK

Company's properties which serve 142 communities in Colorado. He is a member of the Doherty Men's Fraternity and chairman of the Commercial Section, Rocky Mountain Division, N.E.L.A., and has succeeded Mr. Semrad as a member of the advisory board of the Electrical League of Colorado.

C. F. Norton, general manager, **Howell Electric Motors Company**, Howell, Mich., during a tour of Pacific Coast territory spent a week in Los Angeles and a week in San Francisco in March, and then continued his journey by way of Seattle, Vancouver and other Northwestern cities.

W. H. Onken, Jr., editor of Electrical World, New York City, was one of the speakers at the recent meeting of the United States Chamber of Commerce held in Washington, D. C.

E. H. Hatch, for seven years resident construction engineer on the larger power projects of the Pacific Gas and Electric Company of San Francisco, has resigned to accept a position with the British Columbia Electric Railway Company, Ltd., of Vancouver, B. C., as engineer on new development work. Mr. Hatch has had extensive experience in general engineering and construction on highway, irrigation and power development.

Herbert S. Sands, manager of the industrial division Westinghouse Electric & Manufacturing Company, Denver office, has resigned and opened offices in the First National Bank Building as a consulting engineer. Mr. Sands is president of the Colorado Engineers' Council and of the Colorado State Board of Engineers' Examiners and vice-president of the American Institute of Electrical Engineers.

Miss Frances E. Pratt, who has been associated with the publicity department of San Joaquin Light & Power Corporation, Fresno, Calif., for a year and a half and with the San Joaquin company for over three years, has resigned to become assistant manager of West Coast Theaters in Fresno.

Harold K. Fox, chief construction engineer for the San Joaquin Light & Power Corporation, during a recent trip East delivered a lecture on "Meeting the West's Electrical Demands" before the engineering students of Princeton University. He showed a series of stereopticon slides of construction operations on the Balch project of the Kings River development, using that hydro-electric plant as a background for his discussion. Mr. Fox was accompanied by Mrs. Fox.

R. C. Shipman, formerly Seattle representative for the Allied Industries, has severed his connection with that concern and has gone into business for himself. **T. J. Fly** will replace him with the Allied Industries.

H. D. James, consulting engineer on electric control for the Westinghouse Electric & Manufacturing Company, East Pittsburgh, and for many years head of that company's control engineering department has been spending the past month in a tour of the Pacific Coast.

Frank J. Kiefer, who has been acting as factory representative for The Armstrong Manufacturing Company, Huntington, Va., with headquarters in San Francisco, has severed his connection with that concern. Prior to his affiliation with the Armstrong company Mr. Kiefer was for three years field representative for the California Electrical Bureau.

W. I. Patterson, president, Steel City Electric Company, Pittsburgh, accompanied by Mrs. Patterson, recently spent several weeks in California.

Joseph Bowes, formerly general manager, Gulf States Utilities Company, Louisiana Division, has been made manager of the El Paso Electric

JOSEPH BOWES

Company, El Paso, Texas, succeeding **Tom P. Walker**, who has been made vice-president of the Virginia Electric Power Company with headquarters in Norfolk. Both companies are Stone & Webster properties. Two years after having been graduated from Cornell University as an electrical engineer in 1907, Mr. Bowes entered the employ of Stone & Webster, his first position being that of superintendent of operations of the Light and Power Department of the Tacoma Railway & Power Company, Tacoma, Wash. In 1916 he was made general superintendent of the Southwestern District with headquarters in Port Arthur, Texas, and seven years later he was transferred to Beaumont, Texas, as general superintendent of the Eastern Texas Electric Company. When the property at Lake Charles was purchased in August, 1924, Mr. Bowes was chosen as manager, and two years later when that property was consolidated with those which now comprise the Gulf States Utilities Company, Louisiana Division, he became general manager in charge of all operations in Louisiana.

Henry Cecil Webb, Jr., formerly superintendent of sales of the Gulf States Utilities Company, Louisiana Division, and prior to that sales manager of the Baton Rouge Electric Company, has been made sales manager of the El Paso Electric Company, El Paso, Texas. Prior to going to Baton Rouge Mr. Webb was assistant city sales manager of the El Paso company. **J. H. Warden**, who has been acting sales manager, has been transferred to the Gulf States Utilities Company, Louisiana Division, as industrial engineer with headquarters at Lake Charles, La.

W. F. Hynes, Northwestern sales manager, General Electric Company, Portland, recently received one of the Charles A. Coffin awards offered annually by that company to employees for exceptional service. He was the only employee on the Pacific Coast among the twenty-seven so honored by this year's awards.

Frank Blake, general manager, Hawaiian Electric Company, Honolulu, recently paid a visit to San Francisco. While in that city he attended a luncheon of the Electrical Development League as the guest of **C. E. Heise** of the Westinghouse Electric & Manufacturing Company.

W. Wesley Hicks of the Wesix Electric Heater Company, San Francisco, recently returned to that city from a trip to Honolulu.

S. Morgan Smith, president of the S. Morgan Smith Company, York, Pa., made a tour of the Pacific Coast a short time ago.

Frank L. Dame, president of The North American Company, New York City, spent some time in California recently inspecting the plants of the Great Western Power Company and the San Joaquin Light & Power Corporation, subsidiaries of the Western Power Corporation which is controlled by The North American Company.

Frank A. Short has been reappointed electrical engineer of the Industrial Accident Commission with headquarters in Los Angeles. Mr. Short served five years with the commission from 1918 to 1923, leaving there to take a position as electrical engineer with the Safety Electric Products Company of Los Angeles with which he has been associated up to the present time. Mr. Short has spent practically his entire business life in California. Shortly after leaving school in 1900 he entered the employ of the City of Riverside Electric Light Department, remaining there until 1905 when he entered the building construction field in San Jose. In 1910 he returned to the Riverside Elec-

FRANK A. SHORT

trical Department as construction foreman, and from 1912 to 1918 he had charge of electrical inspection and engineering for the City of Riverside Electric Light and Water Departments. Mr. Short takes an active interest in the organizations of the electrical industry, being a member of the American Institute of Electrical Engineers, California Association of Electrical Inspectors, Pacific Coast Electrical Association, Southern California Society of Safety Engineers, Los Angeles Electric Club, and Synchronous Club.

D. C. Harker, formerly with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, has joined the San Francisco staff of that company as office engineer.

William E. Andrews, who for a number of years past has been affiliated with the Alexander & Lavenson Electrical Supply Company, recently resigned to accept the position of branch manager of the Westinghouse Lamp Company, Seattle, with sales supervision throughout the states of Oregon and Washington. Mr. Andrews (more familiarly known to the electrical fraternity as Billy Andrews) has been closely identified with the wholesale and retail electrical merchandising industry in California for a number of years, as prior to his affiliation with the Alexander & Lavenson company he was for years associated with the H. W. Johns-Manville Company, now Johns-Manville Corporation.

D. C. Green, vice-president and general manager, Utah Power & Light Company, Salt Lake City, has been reelected as a member of the board of directors of the Utah Associated Industries.

Frank LeRoy Blanchard, director of public relations, Henry L. Doherty & Company, New York, recently spoke at a meeting of the Advertising Club of Denver on the subject, "Some Prevailing Misconceptions with Regard to Advertising."

Charles M. Brown, sales manager, Woodrow Manufacturing Company, Newton, Iowa, recently completed a tour of the eleven Western states. He has been maintaining temporary headquarters in Los Angeles.

Edward C. Murphy, who has been connected with the United States Geological Survey for the past thirty-five years, has been retired under the act for retirement of employees in the classified civil service. Mr. Murphy has been in California since 1906, having gone there to assist the late Dr. G. King Gilbert in his studies on the transporting power of rivers. Since the completion of that work Mr. Murphy has been assigned generally to special studies of water power and irrigation in their relation to the classification of public lands.

L. W. Edwards, formerly assistant superintendent of the Willamette division at Albany, Ore., of the Mountain States Power Company, Tacoma, has been transferred to the Casper, Wyo., division of that company to be superintendent.

H. E. Baker, formerly district manager at Hood River, Ore., for the Pacific Power & Light Company, Portland, has been appointed assistant superintendent of power at Clarkston, Wash., for the eastern end of the Pacific company's system comprising the Clarkston, Wash., Lewiston, Idaho, and Grangerville, Idaho, territory. His supervision will include the operation of the new Lewiston hydroelectric plant to be brought in this year.

Charles A. Semrad, vice-president and commercial manager of the Public Service Company of Colorado, Denver, has been made vice-president and gen-

CHARLES A. SEMRAD

eral manager of the St. Joseph Railway, Light Heat & Power Company, St. Joseph, Mo. Mr. Semrad was born in Highland, Wis., July 5, 1885, and is a graduate of the University of Wisconsin, class of 1907. In 1912 he became associated with the Boulder office of the Northern Colorado Power Company which in 1915 was reorganized under the name of the Western Light & Power Company. In 1914 he undertook the management of the Cheyenne Light, Fuel & Power Company in Cheyenne, Wyo., a subsidiary of the Northern company, and later became manager of the Western Light & Power Company's properties with headquarters at Boulder. In December, 1918, the Henry L. Doherty interests took over the Western company, and six years later Mr. Semrad was transferred to Denver to assume the duties of vice-president and commercial manager, a position which he has held until his recent promotion. Mr. Semrad who always has taken an active part in the affairs of the Rocky Mountain Division of the N.E.L.A., served as its president for the term 1925-1926.

Obituary

Julius Merriam Howells, for many years consulting engineer for the Great Western Power Company, died in San Francisco April 22 following a stroke of apoplexy. Mr. Howells designed the Big Meadows Dam in Plumas County, Calif., for the Great Western company and had been connected with several hydroelectric power developments in New Mexico, Texas and Arizona.

William Augustus White, vice-president and trustee of The Washington Water Power Company, Spokane, and chairman of its finance committee, died at his home in New York City May 6 at the age of 83. Mr. White was familiarly known as "the father of The Washington Water Power Company."

Manufacturer & Distributor

The Edwin S. Guth Company, St. Louis, has announced that **Ernest H. Greppin** has been appointed assistant district manager of its Los Angeles territory, reporting to **L. A. Hobbs,** district manager, with headquarters in San Francisco.

The W. N. Matthews Corporation, St. Louis, has announced that **Arthur E. Bacon,** Denver, Colo., will be its representative in the state of Utah in addition to the other territory which he covers for that company. The territory formerly was covered by **B. C. Holst,** district manager in San Francisco, and the transfer was made in order to enable Mr. Holst to devote more of his time to California, Washington, Oregon, Idaho and Nevada.

John C. Douglas, formerly associated with the Edison Electric Appliance Company, and later with Johnston-Ayres Company, San Francisco, has been appointed Pacific Coast representative of the **National Refrigerating Company** of New Haven, Conn. This company, a subsidiary of the **Winchester Repeating Arms Corporation,** manufactures the Ice-O-Lator, an absorption type electric and gas operated refrigerator. Mr. Douglas will make his headquarters in San Francisco and has opened offices in the Rialto Building.

The Chicago Fuse Manufacturing Company, Chicago, has purchased the Powerlet line of ripid conduit fittings formerly manufactured by the **Multi Electrical Manufacturing Company** and in the future will manufacture and distribute the line, which will be known as Gem Powerlet conduit fittings. The company announces that a new Gem Powerlet catalog will be ready for distribution very soon.

Crouse-Hinds Company, Syracuse, N. Y., has purchased the patents and all manufacturing rights for Groudulets and Groundulet accessories heretofore manufactured by the **Groundulet Company** of Newark, N. J., and will continue the manufacture and sale of those products. **S. W. Borden,** president of the Groundulet Company, will be associated with the Crouse-Hinds Company and will devote his entire time to the study of electrical grounding and the development of suitable devices for it, according to the announcement of the company.

The Rainier Electric Company, for seven years located at 219 Seneca Street, Seattle, has removed to 1109 Third Avenue in that city.

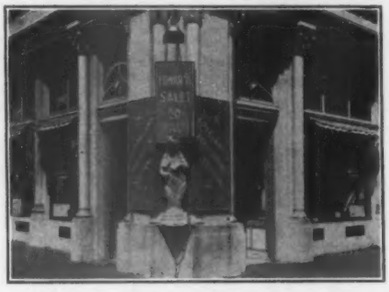
The Square D Company, Detroit, is building an addition to its main plant in that city. This addition will enlarge the available floor space by 15 per cent. The new construction was required, according to **T. J. Kauffman,** treasurer and general manager, to provide increased production facilities. Plans are also under way to enlarge the company's porcelain plant at Peru, Ind. This contemplated construction will double the present floor space at that plant.

Edison Electric Appliance Company, Inc., 5600 West Taylor Street, Chicago, has been awarded the International Grand Prize by the International Jury of Awards of the Sesquicentennial International Exposition for the superior quality of the Hotpoint electric appliances. In celebration, the Edison company is planning a "Gold Medal Week" from June 4 to June 11. During this period it will make special offers on its "Trenton" percolator set and other Hotpoint items.

Frank Adam Electric Company, 3650 Windsor Place, St. Louis, Mo., has placed **Bert S. Fuller** in charge of its Stewart Works at 425 Folsom Street, San Francisco. **Jack Stewart,** former manager, has acquired an interest in the **Columbia Electric Manufacturing Company,** 59 Columbia Square, in that city.

Sterling & Harkness, 164 Townsend Street, San Francisco, have been appointed Pacific Coast representatives for the **Collyer Insulated Wire Company,** Pawtucket, R. I.

Allied Industries, Inc., has named **E. A. Will** as manager of its Seattle branch, succeeding **T. J. Ely.**



The Copeland Refrigerating System now is represented in San Diego by the Edwards Sales Company, Inc., which recently opened a large store at the corner of First and Broadway in that city. H. J. Edwards is president, Harry R. Collins, vice-president, and L. A. Walker sales manager of the company.

The Rockbestos Products Corporation of New Haven, Conn., manufacturer of asbestos covered wire and cables, has appointed **Allied Industries, Inc.,** its representative for the Pacific Coast and adjacent territory. **George W. Barker,** formerly connected with Allied Industries and more recently sales manager for the **Sandoval Sales Company,** San Francisco, has rejoined the former organization and will act as special representative and sales engineer for all Rockbestos products.

The James R. Kearney Corporation, St. Louis, has appointed **Oscar H. Davidson Equipment Company,** 1633 Fremont Avenue, Denver, as its representative in that territory. **L. Brandenburger,** 149-151 West Second South, Salt Lake City, will represent the Kearney corporation in the Utah and Arizona territory.

Avalon Electric Manufacturing Company is the new name of the A.T.H. Electric Company, manufacturer and wholesaler of electric fixtures, 10501 Avalon Boulevard, Los Angeles. The active members of the firm, which has been reorganized, are **W. F. Taylor** and **Harry Ham** of Los Angeles, and **David O. Wood,** formerly of San Francisco.

William Goodrich, president and sales manager, Goodrich Electric Company, Chicago, recently spent two weeks in California on business. While in Los Angeles and San Francisco he conferred with the **J. G. Pomeroy Company,** his company's Pacific Coast representative.

The Maytag Company, Newton, Iowa, has removed its Pacific Coast headquarters from 1924 Broadway, Oakland, Calif., to 1024-1025 DeYoung Building, San Francisco. **E. L. Marriage** is Pacific Coast manager.

Fairbanks, Morse & Company, Chicago, have announced that **W. S. Hovey,** vice-president and general manager, has been elected president of the company, the former president, **C. H. Morse,** having become chairman of the board. Mr. Hovey will remain general manager. The company has also announced that it has taken over the scale business of The Fairbanks Company of New York.

C. C. Hillis, until recently vice-president of **Allied Industries, Inc.,** with headquarters in San Francisco, and prior to that president and treasurer of the Electric Appliance Company of that city, has severed his connection with Allied Industries to engage in business for himself. He will represent the **Triangle Conduit Company, Inc.,** Brooklyn, N. Y., with office and warehouse at 390 Seventh Street, San Francisco.

New Equipment

Two New Electric Range Models

Graybar Electric Company, Inc., distributors of **Crawford electric ranges** manufactured by Walker & Pratt Manufacturing Company, Boston, has announced the addition of two new models to that line suitable for use in small bungalows, cottages and apartment homes. The range shown, Model 14-61, of cast iron construction, has the following over-all dimensions, 36 in. long, 21½ in. deep, 41¾ in. high, oven 14 x 14 x 17½ in. inside, cooking top, 18 x 19⅝ in. inside. The range has two 6-in. 1,000-watt heating elements and one 8-in. 1,500-watt element, all of the center heat type, and it has two 1,000-watt interchangeable units in the oven. Other features are: reciprocating switches, shelf-type oven door with new patent adjustable, non-breakable spring

underneath, enamel switchboard cover, rustproof oven lining of Toncan metal and Monel metal wiring; shipping weight 235 lb.; Pacific Coast list price $95.50.

Over-all dimensions of the range, Model 16-51, are: 24 in. long, 16¼ in. deep, 13½ in. high (without shelf), 47½ in. high (with shelf), oven 16 x 12 x 12 in. inside, cooking top 24 x 16¼ in. inside. Heating elements consist of one 6-in. 1,000-watt and one 8-in. 1,500-watt and two 1,000-watt interchangeable units in the oven; shipping weight 140 lb. (with shelf 170 lb.); Pacific Coast list price $78.25 (with shelf, $87.25).

Heat Control and Safety Plugs

The Frank E. Wolcott Manufacturing Company, Hartford, Conn., has added to its line two **plugs** for electric flat irons; one, the Torrid-Thermo plug (above) provides variable heat control, any desired heat being obtained by turning a bright red knob on the plug. Uniform flatiron temperatures may be maintained accurately at any point between 100 and 600 deg., according to the announcement. This plug may be used on alternating current only.

The Torrid automatic safety plug (below) functions on both alternating

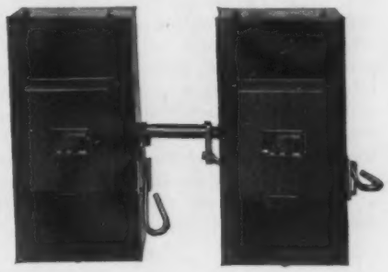
and direct current. When the temperature in the sole plate of a Torrid-Safety equipped flatiron reaches 600 deg. F. a patented thermostatic control cuts the current off instantly, the manufacturer states. The plug switch must be thrown in by hand before the circuit can be completed again.

The list price of the complete cord set equipped with either plug is $2.50; each plug only, $2.

Dual Service Switches

Dual service entrance control from duplicate feeders is provided for in capacities ranging from 30 to 400 amp., 250 volt, 2, 3 and 4 pole, by a recent addition to the Classification AA line of enclosed fused switches manufactured by **The Palmer Electric & Manufacturing Company,** 175 Fifth Street, Cambridge, Mass.

This arrangement consists of two standard Classification AA fused switches provided with a mechanical in-



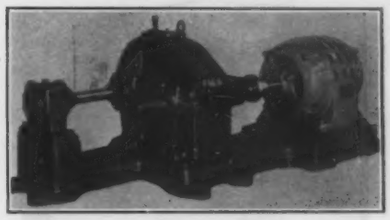
terlock that permits either one of two services being connected to load. Each service connection is fused and enclosed in a separate switch cabinet.

A new **float switch** to control a.c. or d.c. automatic starters or small a.c. motors, single or polyphase, 2 hp. or less, has been placed on the market by the **Industrial Controller Company,** 306 Hanover Street, Milwaukee, Wis.

Speed Reducers

The Falk Corporation, Milwaukee, Wis., has brought out a new line of **speed reducers.** These units feature the Falk continuous tooth, all-steel herringbone gears. Special design of housing eliminates any internal ribs, projections or complicated cores, it is announced. Lubrication has been simplified in this way and all possibility of dirt or core sand working into the gears has been removed, according to the manufacturer. Added features are the airplane type, steel-backed, babbitt-lined bearings that are capable of carrying heavier loads and an improved automatic continuous lubrication system.

The reducers are made in three types, single reduction for ratios up to 9:1,



double reduction for ratios up to 70:1, and triple reduction for ratios up to 300:1. A double reduction unit, No. 7-D, is shown in the illustration.

Small Waffle Iron

The **Star-Rite Junior** waffle iron is being offered by the **Fitzgerald Manufacturing Company,** Torrington, Conn., as suitable for individual service for the family of two and for bridge or party

use. It is made of steel, copper and nickel plated, and the grids are of aluminum, 5 in. in diameter. This iron has an ebonized hand, an adjustable hinge, a 6-ft. cord permanently attached with separable plug and weighs 3 lb. in carton. Price $3.95. **George D. Lee** is Pacific Coast manager with headquarters at 1211 Van Ness Avenue, San Francisco. His territory includes the eleven Western states.

The Rome Manufacturing Company, Rome, N. Y., has announced an improved design of the **Rome electric auxiliary heater** which is of the circulating air type, using a 600-watt heating element. An outstanding feature is the all-copper body with highly nickeled brass top, base and legs. The price of the new model is $10.

Conveyor Toaster

The Edison electric conveyor toaster manufactured by the **Edison Electric Appliance Company,** 5600 West Taylor Street, Chicago, operates on the endless conveyor principle. After the bread is placed on the conveyor rack at the front of the toaster no further attention or handling by the operator is required. As described by the company, the conveyor carries the bread between two glowing elements and by the time the slices arrive at the other end of the conveyor, they are perfectly toasted. The slices then drop into a chute and are returned to the operator about four or five inches below the place where they started. Scorching of the bread

or burning of the edges is prevented by an ingenious arrangement of damper controls, according to the manufacturer. These dampers also are used for regulating the heat for various kinds of bread and for continuous or intermittent service. Under continuous service 480 slices of standard size toast can be produced in one hour. The toaster, finished in white enamel with nickel trimmings, occupies a space of 19 x 24¼ in.

The Nucode bell-ringing transformer, manufactured by the **Jefferson Electric Manufacturing Company,** 501-511 South Green Street, Chicago, now has been improved, according to the manufacturer, so that the transformer may be attached and a drop cord hung from the same outlet box. This new model also will fit both 3¼ and 4-in. outlet boxes. Size, 2¼ x 2⅜ x 2¼ in.; weight, 1⅛ lb.

The Apex Manufacturing Company, Cleveland, has announced a new model **vacuum cleaner,** similar to the Economy Model Apex except that it has a Scotch plaid bag and red handle and a slightly wider nozzle. The company also has placed on the market its new portable-folding **electric ironer** with eight special convenience features, and a new model **washer.**

Recent Publications

Safety Switches.—Bulletin No. 7 issued by the **Trumbull Electric Manufacturing Company,** Plainville, Conn., includes a revised listing of all types of safety switches and also residence and unit panel boards. Among new features is the listing of motor circuit switches with maximum hoursepower rating of motors to prevent orders being placed my ampere rating. New devices listed are Type A safety switches, double throw—no fuse and double throw-fusible, shown on page 15, and a unit panel board, single-door construction, shown on page 101.

Arc Welding Instruction Manual.—The Lincoln Electric Company, Cleveland, has ready for distribution the 1927 edition of the "Stable-Arc" Welding Instruction Manual. This publication is revised annually to cover the latest practices used in manual arc welding. Among the subjects treated are high-speed steel welding and the welding of high-pressure pipe automobile frames, boilers, cast-iron manganese steel, carbon arc welding, and the manufacture of machinery and equipment using welded steel in place of castings. Price $1.

Filters.—The Fer-Mas Company, 235 Elizabeth Avenue, Newark, N. J., an associate of the **United Radio Corporation,** has issued a leaflet describing its Type D-1 filters for motor vehicles, motor boats, airplanes, stationary engines and every description of liquid fuel apparatus where ⅛-in. to ¼-in. inside diameter pipe and pipe fittings allow a sufficient flow. A separate leaflet gives prices and terms on the company's Type D and Type D-1 filters.

Standard Glass Insulators.—Hemingray Glass Company, Muncie, Ind., has ready for distribution a new catalog which, in addition to describing its complete line of glass insulators for telephone, telegraph and electric light and power distribution, carries also small pictures of its plant and the different stages in the manufacture of insulators. It also announces a new type of package, whose use as against its standard barrel is optional.

Relays and Electrical Instruments for Signal System Testing.—Two new bulletins have been announced by the **Roller-Smith Company,** 233 Broadway, New York. Supplement No. 1 to Bulletin No. 550 covers the new type FR line of relays. Supplement No. 1 to Bulletin No. 100 covers several types of instruments which are used principally in signal system and automatic train control work.

Lightning Arresters and Oil Circuit Breakers.—"Facts," form F 4730, and "Protection," Circular 1737-B, dealing with autovalve lightning arresters recently have been released by the **Westinghouse Electric & Manufacturing Company,** East Pittsburgh. That company also has ready for distribution Circular 1771, "Oil Circuit Breakers Types B-16, B-20 and B-26." Copies of these publications may be obtained at any of the district offices of the Westinghouse company or from the publicity department in East Pittsburgh.

Single-Phase Distribution Transformers.—Wagner Electric Corporation, St. Louis, has issued Bulletin 148 on single-phase distribution transformers, HE type, fully illustrated and with numerous tables and dimensional diagrams.

Steam Turbo-Generators.—This is the title of descriptive circular No. 100 published by **American Brown Boveri Electric Corporation,** 165 Broadway, New York City. The booklet goes into much detail and there are many illustrations and cross-sections. **Garland-Affolter Engineering Corporation** of Seattle, San Francisco and Los Angeles, are the Pacific Coast representatives of this firm.

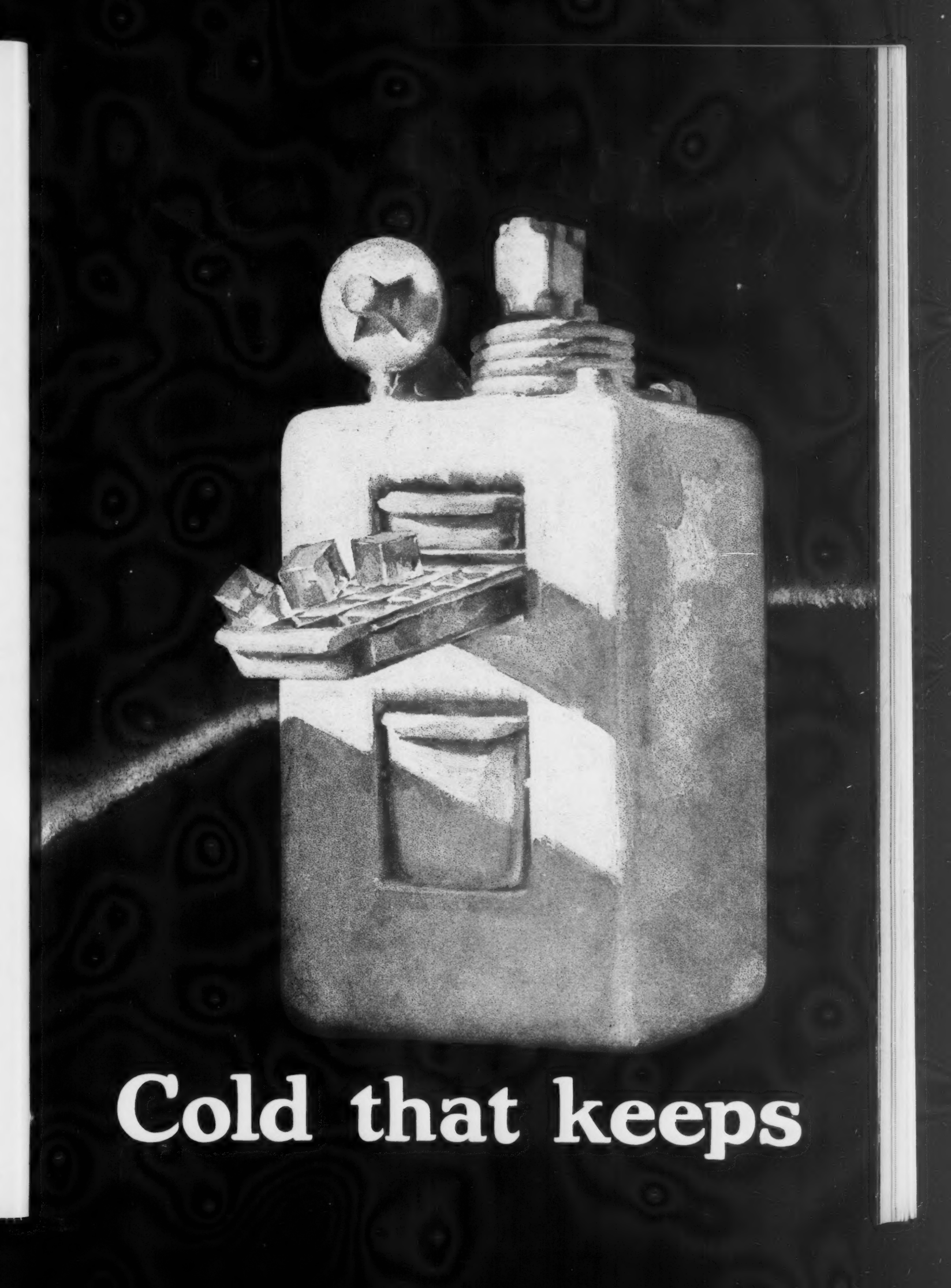
Eclipsing Metal for Many Uses.—This is the title of a leaflet published by the **Bakelite Corporation,** 247 Park Avenue, New York, illustrating some of the products in which Bakelite replaces metal.

A Brief Outline of Its Function and Purpose.—This is the self-explanatory title of a pamphlet published by the **National Electrical Manufacturers Association.** Copies may be secured from the association's offices at 420 Lexington Avenue, New York. The association also has compiled a **Handbook of Radio Standards,** price $1.

Frigidaire Electric Refrigeration Keeps Food Cooler, Better, Longer.—This booklet, distributed by the **Frigidaire Corporation,** Dayton, Ohio, sets forth the advantages and conveniences of a Frigidaire refrigerator and describes the various models made by the company.

Electric Appliances.—In a folder recently issued by **Manning-Bowman & Company,** Meriden, Conn., are illustrated some of the most desirable electric appliances for the home manufactured by that company.

Shelf-Type or Kitchen Unit Ranges.—In Bulletin A 132 **The Standard Electric Stove Company,** Toledo, Ohio, has described six shelf-type electric ranges which it recently has developed.


Cold that keeps

The 1927 Kelvinator for Central

Since Kelvinator started to develop electric refrigeration, back in 1914, it has always realized that any job of electric pioneering can best be done by working shoulder to shoulder with the Central Stations. You have led the way in providing industry with modern tools and in bringing to the home easier and better ways of living. And from the very beginning Kelvinator has tried to work with you to help supply an always better refrigeration service—economical, reliable, healthful and convenient.

It is a matter of record that Kelvinator has the largest established connection with your industry. Kelvinator has had Central Stations as dealers working with it longer and has more Central Station dealer years than any other manufacturer of electric refrigeration. Likewise a longer history of successful service to Central Station customers. For these reasons no other manufacturer in our field knows your problems so well or so fully understands your responsibilities.

Therefore, Kelvinator announces the formation of a Utilities Division for the specific purpose of affording you greater and more intensive cooperation. Definite policies have been adopted and are now in force which make Kelvinator more than ever the most attractive and profitable electric refrigerator partnership ever offered to you.

Kelvinator Central Station Policy

1 Kelvinator has always insisted on the thorough training of installation and service men to insure satisfied customers. Kelvinator realizes the importance of preserving and strengthening your customer relationships, and for that purpose has provided training schools at the factory and in the field at its expense. Thorough sales training is also given by the unique Kelvinator Institute.

2 The Kelvinator Utilities Division field organization is yours—though its members are on our payroll—ready to respond on instant notice to your call. Not only on any installation or service problem, but on anything connected with sales or engineering also, you can count on both

Partnership Plan
Stations

counsel and expert material help. Centered at seventeen zone headquarters—and more coming—a compact, fighting, well trained crew always close at hand.

3 You may have absolute assurance, backed by the factory guarantee, that every Kelvinator shipped will be in perfect condition for installation. Precision standards govern every manufacturing operation. Every Kelvinator part is carefully inspected and tested before final assembly. The whole machine is given a rigid running test for twenty-four hours. Such perfection is reflected in Kelvinator's history of reliable performance over long periods of time, and in the lowest servicing cost of any electric refrigerator—now point ninety-four [.94] calls per unit per year. We urge you to ask any friend of yours in the Central Station industry, who has sold and is now selling Kelvinators, for endorsement of the truth of our statements on Kelvinator's low servicing requirements.

4 Greatly enlarged capacity afforded by Kelvinator's new plant in Detroit insures even more prompt shipments of all machines and parts. Kelvinator's faith in the future of this industry is proved by its investment of $5,000,000 in land, buildings and equipment to increase Kelvinator's production, and for augmenting the manufacturing facilities of the Leonard plant at Grand Rapids, at which all Kelvinator cabinets are built.

5 Kelvinator is the only manufacturer in its field who can offer you a complete line for all types of electric refrigeration. Suitable to any need of every customer—both self-contained or remote installations. Leonard boxes—the largest selling refrigerators in the world—in all styles and at all prices. The de luxe Jewett solid porcelain line. Absolutely the last word in refrigerators. With such equipment you can master any sales situation.

6 A liberal cooperative advertising plan—built especially for you—has been included in this Kelvinator policy. Every possible sales help will be provided—direct mail campaigns—newspaper mats—window display material—together with tried and proved sales and merchandising suggestions. And the best resale assistance in the industry, if you desire it.

Kelvinator

The Oldest Domestic Electric Refrigeration

"Better-Always-Better"

Please get these COLD FACTS

Kelvinator is simplified electric refrigeration beyond which science has not gone.

Kelvinator has pioneered every successful development in the industry.

Kelvinator has invited more imitations than any other system.

Kelvinator is the only system that has never had to take backwater or change the basic engineering of its original model.

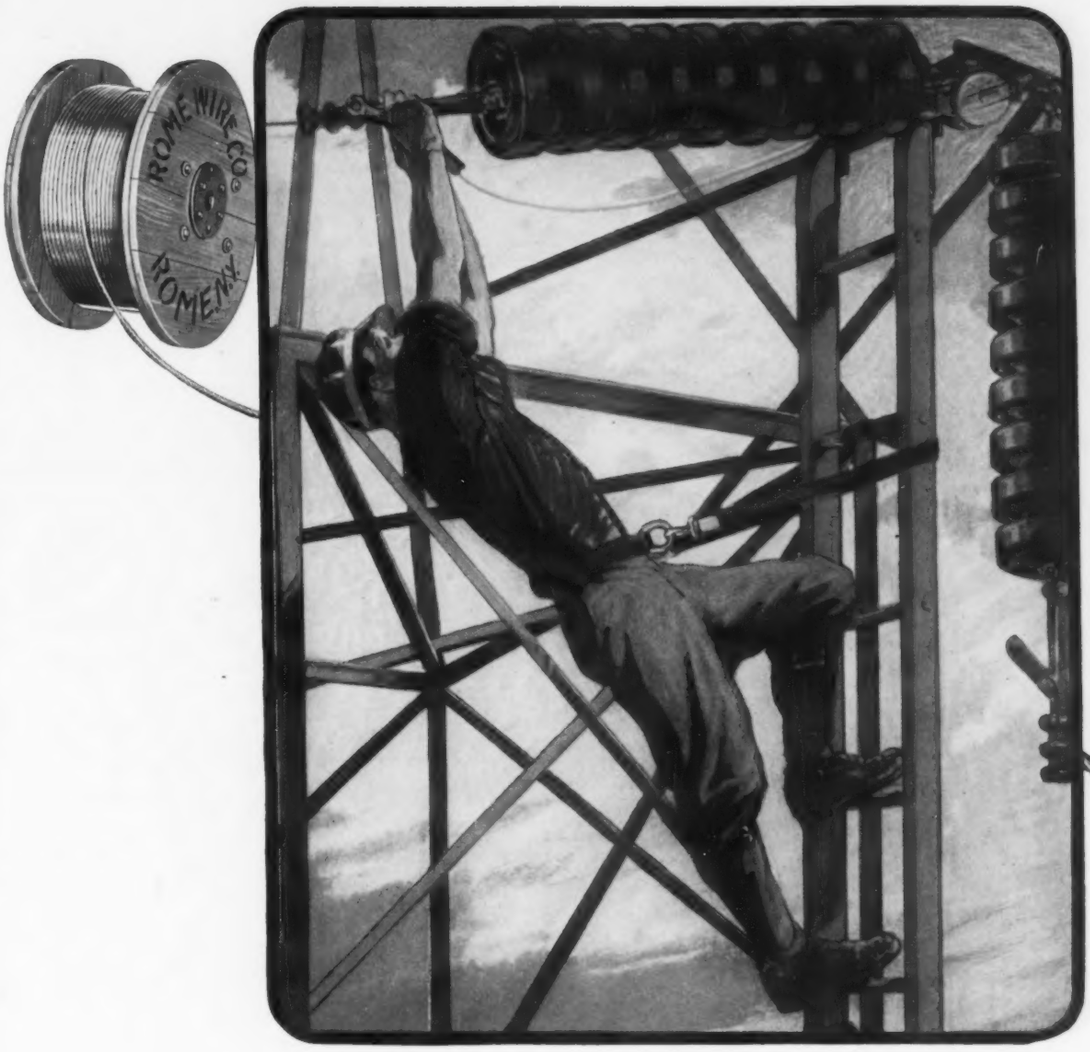
More Kelvinators have been sold by Central Stations than any other make. These new Kelvinator policies are certain to increase this unequaled record.

* * * *

If you are interested in making a connection with a manufacturer of electric refrigeration, who talks your language—has a clear understanding of your problems—is unqualifiedly anxious and able to furnish every cooperation—and who builds a product which will be a continued source of profit, satisfaction and public good will—you are invited to communicate with

KELVINATOR
Division of Electric Refrigeration Corporation
2078 West Fort Street, Detroit, Michigan
Kelvinator of Canada, Ltd., 1148 Dundas St., East, London, Ontario

BT-961



Building a copper highway for power

EACH year sees thousands of new miles added to America's vast network of electrical generating systems. Each year sees an increasing amount of Rome Bare Transmission Cables being strung to build these systems.

If you follow span after span of copper cables on into the distribution circuits, to home and factory, you will find other Rome wires—Rome Weatherproof Wire—Rome Cutting-in and Lead Encased Cables—RomeX, the original non-metallic sheathed cable, and Rome Code Wire.

All these are but a part of the broad line of wires and cables that are manufactured in Rome Mills to fill the countless wiring needs of industry.

Rome Service, ample stocks, and competitive prices, are at your disposal—while an opportunity to quote on any of your wire requirements will always be welcome.

Stranded Copper Wire

ROME WIRE COMPANY, ROME, N.Y.

ROME WIRE

FROM WIRE BAR TO FINISHED COPPER WIRE

Antenna Wire

Weatherproof Wires and Cables

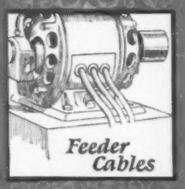
Trolley Wires and Cables

Tinned Copper Wires and Cables

Telephone Wires and Cables

Automobile Wires and Cables

Slow Burning Wires

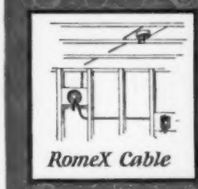

Feeder Cables

Super Service Cords and Cables

Extra Flexible Wires and Cables

Rubber Covered Wires—Code 30% Intermediate

Heater Cords


RomeX Cable

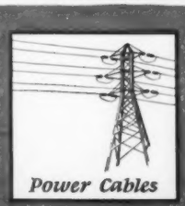
Lamp Cords

Copper Rod and Bare Copper Wire

Lead Sheathed Cables

Magnet Wire

Mining Machine Cables


Power Cables

Radio Wires and Cables

TWENTY acres of manufacturing floor space—over twenty years of manufacturing experience—both are back of every one of the wires you see pictured on this page.

And, functioning as one part of the Rome organization, is an engineering department composed of men whose duty is the study and development of copper wires and cables that will help to lower the cost of power.

If you will let us know what types of wires and cables you are interested in, we will be glad to send you samples, catalogs, and other information that will be of help to you.

Rome-Wire

ROME WIRE COMPANY

Mills and Executive Offices: ROME, N.Y.

Diamond Branch: Buffalo, N.Y.

New York—50 Church Street
Boston—1011 Little Building
Chicago—14 E. Jackson Blvd.
Detroit—25 Parsons Street
Cleveland—1200 W. 9th Street
Los Angeles—J. G. Pomeroy, Inc., 336 Azusa Street
San Francisco—J. G. Pomeroy, Inc., 960 Folsom Street

Kelvinator
Cold that keeps
Startling low price
Announced in newspapers February 7th
Now!
EVEN FOR THE PRICE BUYER
The New "Sealtite" Model Cabinet Kelvinator

A Great Value - -

The most advanced engineering refinements are incorporated in this newest member of the Kelvinator family. . . . Beautiful in design —all-steel exterior—seamless metal food compartment—built like a bridge—finished in Kelvinator gray enamel. Cannot warp, split, chip or crack. Good for a lifetime. The latest Kelvinator exclusive "Sealtite" construction—impervious to moisture. Unusually compact—56⅛ inches high—26½ inches wide—22½ inches deep. Wonderful amount of cold storage space—nearly 5 cubic feet. Light—easy to move about—ideal for small homes and apartments—fits in anywhere.

The greatest achievement of this electric age

Now, even to the price buyer who shops around for electric refrigeration, you have the indisputable answer in this newest model Cabinet Kelvinator. The lowest price in the history of Kelvinator. Price and quality combined put it ahead of all competition—in a class by itself.

Startling New Low Prices have already been announced on all Kelvinator Models ~ ~

The big $5,000,000 building and expansion program of Kelvinator and Leonard, now completed, effects greater production economies which are passed on to the buyer . . . The long-awaited reduction has come. Public interest has been stimulated as never before . . . Kelvinator is now brought within reach of everybody.

The Kelvinator Franchise is a Money-Maker Because

- People accept Kelvination as the last word in efficiency and reliability.
- Kelvinator's engineering and production have been so perfected that servicing costs are the lowest of any electric refrigerator—less than one service call per unit per year.
- Kelvinator has a complete and thoroughly trained field organization for you to call upon for any installation or service problem—for sales or engineering help—domestic and commercial.
- Kelvinator can offer you a complete line for all types of electric refrigeration—self-contained or remote installations.
- Kelvinator's national advertising is broadcasting the message of Kelvination economy, comfort, healthfulness and better living to millions of homes. The country is awake to Kelvination as never before, and eager to enjoy its benefits. A liberal coöperative advertising plan has been specially built to afford you every worth-while sales assistance.

Kelvination

Cold that keeps

One million units capacity

—the Service behind your order

Proof of Kelvinator's Faith in the Industry

KELVINATOR predicts that this year will be the biggest in the history of electric refrigeration—a Kelvinator Year of unprecedented sales—a Central Station Year of greater, steadier loads on established lines through electric refrigeration.

Any company might predict. But Kelvinator has backed up its judgment with this gigantic Detroit plant. . . . The land, buildings and equipment, together with extensions to the Leonard Cabinet Factory at Grand Rapids, represent an investment of $5,000,000.

Kelvinator can now produce 1,000,000 cabinets and freezing units for domestic and commercial purposes annually! Proof of Kelvinator's faith in the industry it leads.

But most important to you—this great $5,000,000 building and expansion program gives you positive assurance of Kelvinator's steady, adequate production—quick service on orders—and prompt shipments of parts and units.

Add to this Kelvinator's special Partnership Plan for Central Stations; its record of longest years in connection with the Central Station industry; the fact that more Kelvinators have been sold by Central Stations than any other make of electric refrigeration, and the advantage of Kelvinator's Utilities Division, especially trained in Central Station problems.

Kelvinator has always worked hand-in-hand with you—always given particular attention to your problems. These are the cold facts back of Kelvinator's unequaled popularity with Central Stations.

If you want to avail yourself of the definite advantages offered by a manufacturer who is giving special consideration to your problems, you will be interested in details of the Kelvinator Plan. The low service record of Kelvinator (only .94 calls per machine per year), its proved efficiency in more than twelve years of actual use, and the wide application of the Kelvinator franchise to any electric refrigeration need are unequaled by any other manufacturer. You can get complete information by writing.

KELVINATOR, 2078 West Fort Street, Detroit, Michigan
Division of Electric Refrigeration Corporation
Kelvinator of Canada, Ltd., 1148 Dundas St., East, London, Ontario

Kelvinator

Oldest Domestic Electric "Better—Always Better" Refrigeration

DT-347

PRINTED IN U S A

— that's the difference in fuses

When a fuse blows—A new fuse? Or just a quick, inexpensive renewal of the old one with a new link? Renewable fuses are serviceable after repeated blowouts. The measure of their saving to you is the number of blowouts they will withstand. Then, why not select the fuse which will stand the *most* blowouts?

Remarkable strength of Union Fuse Casings — correct vents for quick pressure release — design which prevents freezing of threads — these features guarantee the serviceability of "Unions" after many blowouts—insure you continuous savings.

TRADE MARK UNION

UNION FUSES

Because they are worth more they really cost less

UNION Renewable Fuse *features~*

Fusible element replaced in a moment. Fusible member has slotted ends — slips in place when studs are slightly loosened. Threads protected from molten metal — an exclusive Union design.

Grey horn fibre case – very heavy and strong. Correctly proportioned longitudinal vents release instantly the tremendous pressure of volatilizing metal. "Unions" withstand more blowouts.

Few parts. Can't be assembled incorrectly. Accurately rated — blows at the right point — always.

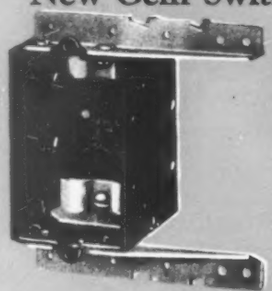
Speedier installation~ a neater job

UNION
Outlet Box 1289X

Round Outlet Box No. 1287 XS. Note the new diagonal clamps combined with bushing plates which eliminate connectors or ferrules. Diagonal clamps tighten from inside after box is fastened up. Also furnished with octagonal type boxes.

Note quick, easy tightening of New Diagonal Cable Clamps from inside of box. Furnished with or without bushing plates.

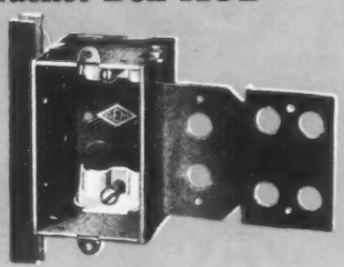
New Gem Switch Box X-3



New X-3 Gem Switch Box with extended ears — a quick box to install on studding. Easily gangable. New No. 7 clamp, with right angle flanges fits snugly around cables — completely closing openings. Tightened from inside after box is installed.

Gem Bracket Box XCB

Lathe support assures solid installation. Bracket quickly nailed to joist or studding—two lugs square up the box which sets flush with plaster. Fitted with New No. 7 Clamps with right angle flange which fit snugly over cable, completely closing openings.



~with UNION-GEM Improved Boxes

Installation time often measures profits on the contract. Improved Union and Gem Boxes speed up installations — widen your margin of profit on every job.

Outlet boxes can be fastened up before cables are cut and anchored. A few twists with a screw driver, tighten up the New Union Diagonal Cable Clamps from the inside —after box is in place. Saves time—makes a neater, more secure job. Use hangers or not, as you like. Note the several other outstanding Union Box features, indicated above by arrows.

It will pay you in added profits to investigate the New Union Outlet Boxes and other New Union-Gem time saving accessories. Write for complete information — to your jobber or direct.

Most all first class jobbers carry Union and Gem Products.

CHICAGO FUSE MFG. CO.
Laflin and 15th Streets, Chicago, Ill.

Send me a copy of Catalog No. 31 giving complete information on Union-Gem products.

Name.....

City.....

State.....

CHICAGO FUSE MFG. CO.

INCORPORATED 1889

ELECTRICAL PROTECTING MATERIALS AND CONDUIT FITTINGS

CHICAGO

is —
olten

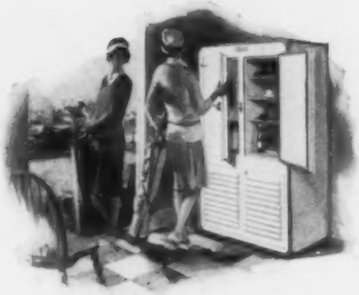
ongi-
sure
outs.
ately

NGS

The overwhelming public preference for

FRIGIDAIRE

can make phenomenal sales increases for Public Utilities Companies—with corresponding increases in load



FRIGIDAIRE is, by a wide margin, the fastest selling electric refrigerator. This fact in itself is enough to account for the rapid increase in the number of Public Utility Companies that hold the Frigidaire franchise. But there are other definite reasons why the Frigidaire dealership offers the greatest opportunity for present and future merchandising success.

Thousands of Commercial Prospects

Think of the sales possibilities of Frigidaire for commercial purposes—for meat markets, groceries, drug stores, delicatessens, restaurants, hotels—any place where refrigeration is used! Frigidaire's wide adaptability meets the exacting requirements of all such commercial users of refrigeration.

Help in finding Prospects—help in closing sales

Frigidaire trade paper advertising reaches every class of commercial user—not once, but many times a year. Printed matter on special types of refrigeration makes sales come easier. Specialists are always available to help in closing important sales—service specialists are employed by the company to solve technical problems in unusual installations.

Biggest Publicity Program in history of the Business

Practically every name in your telephone directory represents a household Frigidaire prospect. The line of eleven self-contained cabinet models, ranging from five to fifteen cubic feet storage capacity, meets the needs of any house or apartment on any street in town. And into every one of those homes goes Frigidaire advertising—daily, weekly, or monthly. For Frigidaire is backed by the biggest advertising appropriation ever known in the industry—one of the largest of any kind in 1927.

No Possibility has been overlooked

Cooperative newspaper and billboard advertising localizes this national publicity. Proven direct-mail matter and follow-ups of all kinds help you to convert the great force into sales in your appliance department—providing greater load on your power lines.

New and striking window displays, for day and night, are constantly being designed by our artists—a strong force in attracting customers to your salesroom and in identifying you as the Frigidaire dealer in your community.

We give your men intensive training

Sales and service schools for both commercial and household refrigeration are constantly being held in convenient parts of the country. Intensive training is given new men—training that gives them in a few weeks the benefit of years of experience and research.

Frigidaire Leadership maintained by General Motors

Remember that Frigidaire is a product of General Motors—with a future guaranteed by the stability, capacity, and financial responsibility of this world-wide organization. Remember that the majority of the electric refrigerators now in use are Frigidaires. Remember that everything that can be done is being done to maintain this leadership, and you'll begin to see what the Frigidaire franchise could mean to the Public Utility Company that holds it.

Investigate the Frigidaire Dealership

Let us tell you specifically what we are doing in your territory—what we have done and what we will do in 1927-8. Let us show you how the Frigidaire dealership offers unlimited sales possibilities in your appliance department and opportunity for greatly increased load on your lines. Write today.

FRIGIDAIRE CORPORATION

Subsidiary of General Motors Corporation

Dept. I-72, Dayton, Ohio

Secretaries should b

Westinghouse Motors *are* E

X91180

be BALANCED

—so should a MOTOR

THE capacity to grasp business essentials; the qualification for tactful contact with many types of personalities; the patience for intricate detail—these and other qualifications a secretary should have. And withal, level-headedness—the poise or "balance" for smooth running.

A smooth running motor—a motor that represents the maximun in ultimate service—must also be balanced.

The "balance" achieved in Westinghouse motors is the result of close association with industries, of first-hand information, of constant research, of continuous development. Every last factor has had the fullest consideration; all are developed for known reasons; none is sacrificed at the expense of another; each is properly proportioned or *balanced* to the other—mechanically, electrically—

Balanced

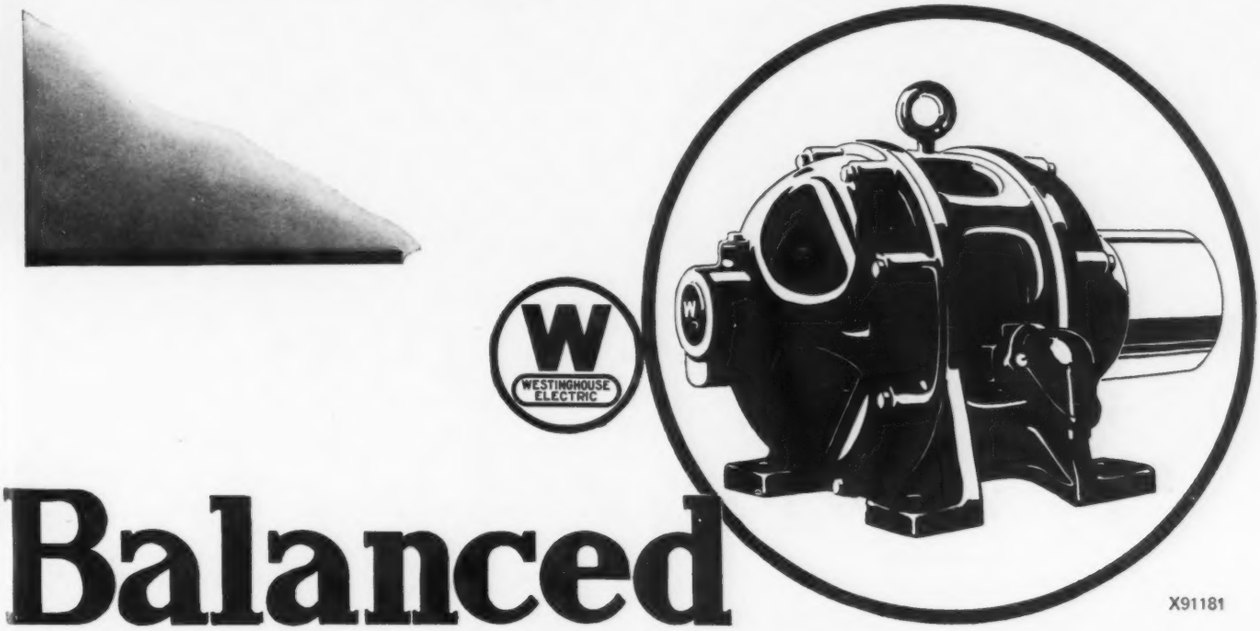
from all these standpoints:

Electrically	Mechanically
1. Temperature	8. Air Gap
2. Torques	9. Bearings
3. Efficiency	10. Shaft
4. Power Factor (in a-c. motors)	11. Steel
5. Speed Characteristics	12. Assembly
6. Insulation	13. Rotating Smoothness
7. Commutation (in d-c. motors)	

To get true value in a motor, look at all these factors, not merely at one or two. Near you is a Westinghouse representative who also is capable of serving you in a balanced way—with the motors that are balanced to your particular requirements.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania

Sales Offices in All Principal Cities of the United States and Foreign Countries

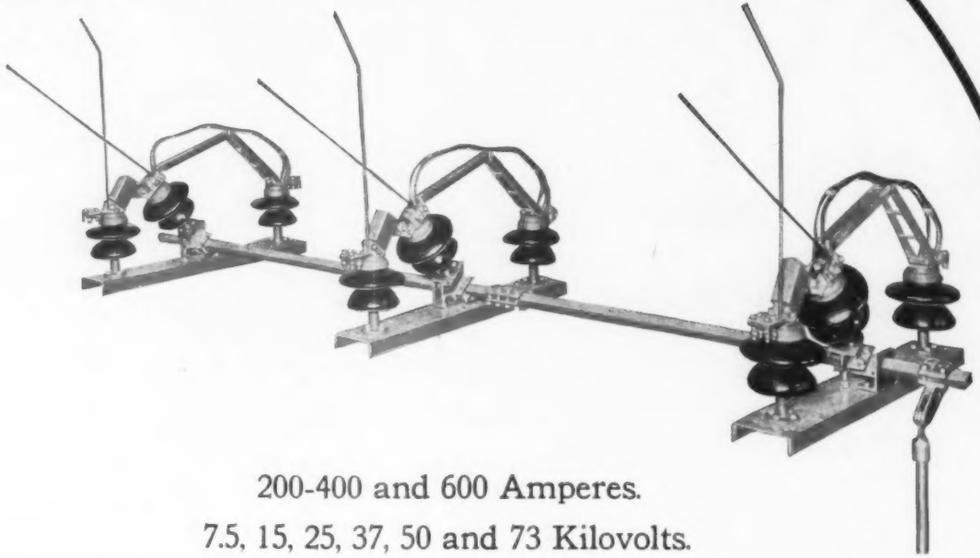


W WESTINGHOUSE ELECTRIC

e Balanced

X91181

The New Type RW, Gang-Operated
Pole-Top, Air-Break Disconnecting Switch



200-400 and 600 Amperes.

7.5, 15, 25, 37, 50 and 73 Kilovolts.

Direct or remote control.

Hand or electrical operation.

Effective sleet hoods.

Well balanced for ease of operation.

Full floating, self-aligning, self-closing contacts.

Twisting action of blade before starting to leave contacts, thereby easily breaking corrosive seal or ice formation.

Even on smallest sizes at least two bolts, with lock-washers, for all line connections.

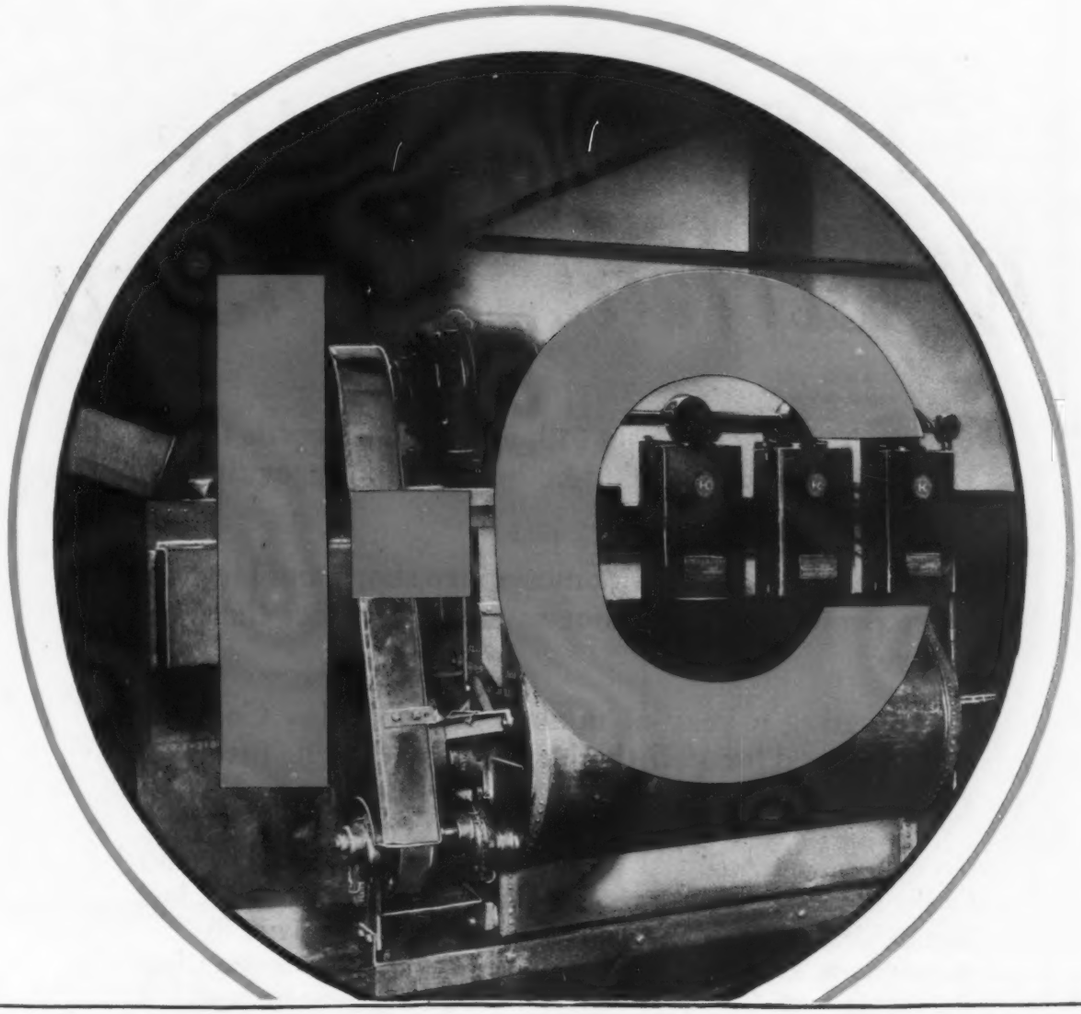
All iron and steel parts hot-dip galvanized.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries

Butte, 52 East Broadway
Casper, Wyo., 124 W. 2nd St.
Denver, 910 Fifteenth St.
El Paso, Mills Bldg.
Fresno, Hotel Fresno
Los Angeles, 420 So. San Pedro St.
Phoenix, Ariz., 412 Luhrs Bldg.
Portland, 901-2-3 Porter Bldg.
Salt Lake City, South Temple and West Temple Sts.
San Francisco, 1 Montgomery St.
Seattle, 3451 East Marginal Way
Spokane, 821 Old National Bank Bldg.
Tacoma, 1117 Rust Bldg.

Westinghouse

X91176



As they Say at Chandler Motor Car Plant

Paul Justus, *Chief Electrician, Chandler Motor Car Plant, Chandler-Cleveland Motor Corp., Cleveland,* says:

"In our Chandler plant we are using 200 Industrial Controller starters and compensators—Across-the-Line Starters, Class 8527, on motors up to 5 H. P., and Automatic Compensators, Class 8605, on motors above 5 and up to 40 H. P.

"In many cases, the location of our machinery makes it very inconvenient, or even impossible, to install a starter at or near the driven machine.

"Then I-C Automatic starters are mounted on posts in the aisles, where they take up no valuable space and the push button control station is placed on the machine in easy reach of the operator.

"I-C starters and compensators are easy to install and are readily inspected. All motors and starters are inspected monthly, and we very seldom have to repair or adjust either motors or starters during working hours. When necessary, an entire starter can be changed in 15 minutes.

"Several I-C Motor Circuit Switches, Class 2400 enable us to make tests for power factor data without interrupting production."

Class 8527. Automatic A. C. Across-the-Line Starter with push-button control.

Industrial Controller Co.

MILWAUKEE, WIS. U.S.A.

San Francisco Office: C. E. Ingalls, Rialto Bldg.
Robinson Sales Co., Polson Bldg., Seattle; 53 Fourth St., Portland

1927---and the Electrical Industry

Our industry needs only to look at past records to realize that each year should be better and bigger than the one just closed.

1927 will see more new homes, more shops and factories, more people wanting labor-saving appliances than ever before.

Anticipating a year of unusual activity this Company has prepared for 1927 the largest budget in its history.

Growth as portrayed by the actual consumption of electric energy in Southern California

Kilowatt Hours Generated	*Year*
1,079,144,624	1921
1,198,926,369	1922
1,548,896,120	1923
1,687,888,206	1924
1,998,856,927	1925
2,200,000,000 (Estimated)	1926

How the Edison Company has met the constant increase in demand by increasing its generating capacity year by year.

Total Generating Capacity	
376,700	Horsepower
376,700	"
503,100	"
626,600	"
735,700	"
805,700	"

SOUTHERN CALIFORNIA
EDISON COMPANY

Owned by Those it Serves

These full pages in Saturday Evening Post, Good Housekeeping, House and Garden, and House Beautiful, reached your best customers. This Armstrong Christmas advertising to 12 to 15 million homes—is still paving the way to quicker sales of the new Armstrong Automatic Range.

Equipped with

CHROMALOX

HEATING UNITS

High Speed Type—
Completely Enclosed

The photograph shows how the new Armstrong Automatic Range is standard equipped with two 1200 watt and one 1500 watt, 8½" Chromalox Range Units.

After all, it is the Heating Unit that determines how long any electrically heated appliance shall operate. Chromalox Heating Units *actually outwear all others!*

A merchandising sensation *in the* electric range field—

having these 6 outstanding features in the Range Units

1. A closed protected unit.
2. High initial heating speed.
3. Operates at visible red heat.
4. Safely withstands commercial overvoltage fluctuations.
5. Capacity for storing heat.
6. Two-in-one burner for three-heat operation.

In brief, a combination of all the good points of both open and previous closed type units. If you are a manufacturer of ranges or equipment which requires a flat surfaced, closed, high-speed, heating unit—write to us.

E.West-1-27

CHROMALOX HEATING UNITS

MANUFACTURED EXCLUSIVELY BY

EDWIN L. WIEGAND CO., 422 FIRST AVENUE, PITTSBURGH, PA.

Sole Canadian Lincensees—The Canadian Chromalox Co., Ltd., 251 Queen Street East, Toronto, Ontario, Canada

The Railway Utility Company of Chicago is the sole distributor of Chromalox Strip Heaters for use in heating railroad and street cars in the United States and Canada

Pacific Coast Representatives: The Electric Materials Co., Inc., 589 Howard St., San Francisco, and 443½ E. Third St., Los Angeles, Calif., and Harrison Sales Co., Sales Terminal Bldg., Seattle, Washington.

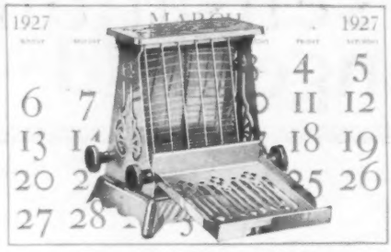
Tie to these Hotpoint Plans for More Appliance Sales

Extensive National Advertising and Dealer Sales Helps Make Hotpoint Servants the Easiest to Sell

Cash in on Hotpoint's extensive national advertising plans. Push Waffle Irons in February, Toasters in March and Percolators in April. Hotpoint's ads in national magazines follow this plan. The National Electric Light Association in its Concurrent Advertising Plan Book recommended the same schedule.

Below are the high spots of Hotpoint plans for increasing the sales of Waffle Irons, Toasters and Percolators.

Waffle Irons—$10.50 and $15.00



Toasters—$6.00 and $8.00

Percolators—$9.00 and up

February—Waffle Irons

Hotpoint Sales Helps:

1. A complete line of quality waffle irons at popular prices.
2. Waffle Iron advertising in February 5 Saturday Evening Post and in February Ladies' Home Journal. Total circulation: Five Million.
3. Beautiful and effective Post Card Broadside for local mailing. Emphasizes appetite appeal of electric-made waffles. To be imprinted with special campaign offer. Return post card for prospect.
4. Appetizing waffle window card.
5. Effective newspaper electros for local advertising use which tie up with national advertising and broadsides

March—Toasters

Hotpoint Sales Helps:

1. A complete line of quality toasters at popular prices.
2. Toaster advertising in March 5 Saturday Evening Post, March Ladies' Home Journal and March Good Housekeeping. Total circulation: Seven Million.
3. Beautiful and effective post card broadside for local mailing. Gives health and appetite appeal of toast made electrically. To be imprinted with special campaign offer. Return post card for prospect.
4. Appetizing toast window card.
5. Effective newspaper electros for local newspaper advertising.

April—Percolators

Hotpoint Sales Helps:

1. A complete line of quality percolators and percolator sets at a wide range of prices.
2. Percolator advertising in April 2 Saturday Evening Post, April Ladies' Home Journal and April Good Housekeeping. Total circulation: Seven Million.
3. Beautiful and effective broadside for local mailing, emphasizes desirability of making and serving coffee at table. To be imprinted with special campaign offer. Return post card for prospect.
4. Appetizing coffee window card.
5. Effective newspaper electros for local newspaper advertising.

EDISON ELECTRIC APPLIANCE CO., Inc.

155 New Montgomery St., San Francisco, Calif.

Factories: Ontario, Calif. and Chicago, Ill.

There is a Hotpoint merchandising specialist in your territory who will gladly help you plan and carry out a successful campaign.

Hotpoint

Send for our complete Sales Plan Book which gives full details of the Hotpoint Plan.

More Power to You —and MORE PROFITS

¶ More than the right hand of friendship, Kelvinator's is a working hand that catches hold of your load and helps you carry it.

¶ It sells your goods. It writes business on your books. It makes public good will for you. It puts money in your pocket. It is the hand of a partner.

¶ Kelvinator proposes to help create and sell your extra load for your profit. That's the net of our proposition.

¶ You get the direct returns from the beginning. There is no servicing drain with Kelvinator. You strengthen your relations with your customers, for every Kelvinator you sell makes a fast friend for you. You enlarge your contribution to the conservation, the increased domestic economy and the greater ease of living—to which every public utility company must contribute for its own existence in these times.

¶ Kelvinator has had more central station dealer years than any other manufacturer of electrical refrigeration. A longer history of successful service to central station customers.

¶ Kelvinator is spending every energy within its power for the sale of your power and to cement its relations with your industry.

¶ Kelvinator offers you a steady guarantee of service to your customers that will not break down—the most dependable that is available, as proved by our twelve years of service to you.

¶ A service that began as the best —and gets better as it grows.

KELVINATOR, 2078 West Fort Street, Detroit, Mich.

Division of Electric Refrigeration Corporation

Kelvinator of Canada, Ltd., 1148 Dundas Street, East, London, Ontario

DT-304

The sign of a good fan

We have planned our 1927 advertising campaign on G-E Fans with just one major purpose—to sell the public the idea that the place to buy good fans is from the G-E Fan Dealer. Their shops can be identified by this sign. Starting in May and continuing into August, General Electric advertisements like those reproduced here, will appear in The Saturday Evening Post, Liberty, and local newspapers. This magazine and

GENERAL
MERCHANDISE DEPARTMENT

-put it over *your* store

newspaper advertising is supplemented by a complete line of new sales helps. This big 1927 advertising plan is sure to boost the fan sales of every dealer who displays the sign.

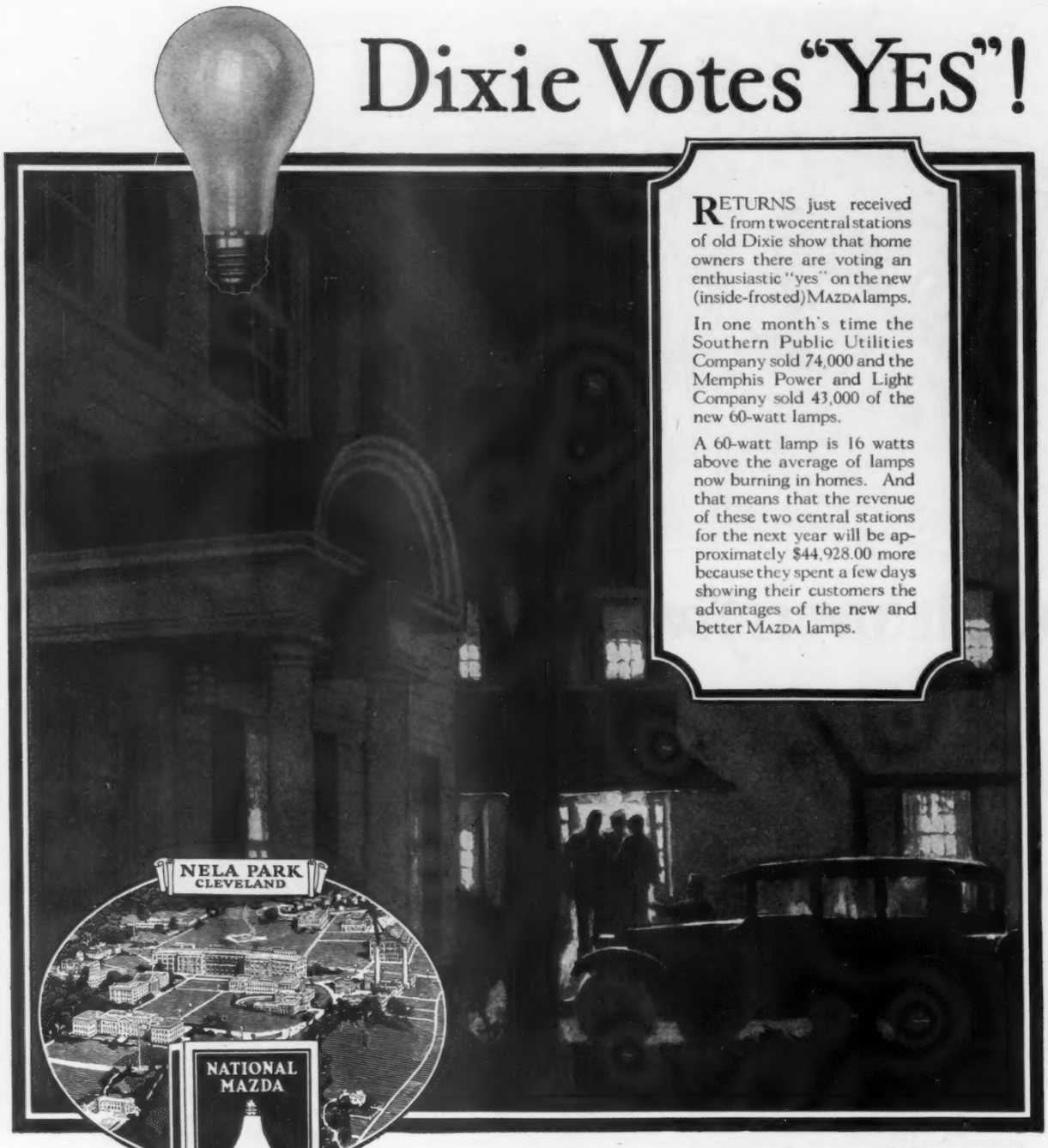
Ask your G-E Merchandise Distributor to show you his 1927 Sales Help Portfolio. Prepare now for a profitable fan season.

If you don't know the address of the nearest G-E Merchandise Distributor, write us for it. G-E Fan Dealers are being appointed now.

ELECTRIC

BRIDGEPORT, CONNECTICUT

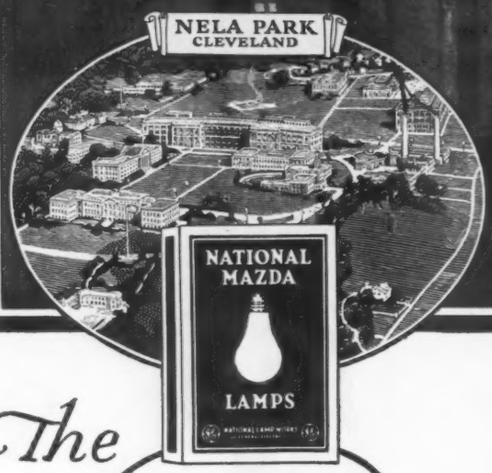
Dixie Votes "YES"!



RETURNS just received from two central stations of old Dixie show that home owners there are voting an enthusiastic "yes" on the new (inside-frosted) MAZDA lamps.

In one month's time the Southern Public Utilities Company sold 74,000 and the Memphis Power and Light Company sold 43,000 of the new 60-watt lamps.

A 60-watt lamp is 16 watts above the average of lamps now burning in homes. And that means that the revenue of these two central stations for the next year will be approximately $44,928.00 more because they spent a few days showing their customers the advantages of the new and better MAZDA lamps.



Nela Park, Cleveland, is a "University of Light" dedicated by the National Lamp Works to improvement in lamps and progress in the art of lighting.

Through its seventeen Sales Divisions and 50,000 retailers, the National Lamp Works markets annually 158 million MAZDA lamps made in twenty-three factories.

These lamps are used in homes, factories, theatres, stores, streets, railways, flashlights and automobiles.

The NEW *National*

A GENERAL ELECTRIC *PRODUCT*

MAZDA LAMPS

"MAZDA" is not the name of a product but the trade-mark of a Research Service, and only those lamp manufacturers entitled to receive this service may distinguish their lamps with the mark, MAZDA.

Your Fan Customers Understand This Language

The newest salesman on your floor can sell Emerson Fans intelligently.

And the customer who "just doesn't know anything about fans" can understand quickly why Emerson Fans are the kind to buy.

The Emerson 5 year Guarantee is the reason. It is the strongest, surest sales point in the whole fan field, and the Emerson is the only *complete line* of fans made that offers this liberal guarantee on all models.

Put the Emerson 5 year guarantee to work in your store this year. It talks to your customers in a language they understand. The quality that makes this guarantee possible is your best assurance of clean, profit-making business.

Emerson fans are made in 9—12 and 16 inch sizes, oscillating or non-oscillating types for A. C. and D. C., also ceiling types. Emerson Jr. fans in 9 and 10 inch sizes provide standard Emerson quality at low prices.

Ask your jobber or write direct for prices, data and list of free advertising helps.

The Emerson Electric Mfg. Co.

2018 Washington Ave., St. Louis, Mo.
608 So. Dearborn St., Chicago 50 Church St., New York City

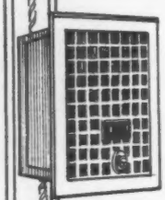
Factory Distributors on the West Coast

BAKER, HAMILTON & PACIFIC CO., San Francisco, Calif.
CALIFORNIA HARDWARE CO., Los Angeles, Calif.
THE ELECTRIC CORPORATION, Oakland, Calif.
THE ELECTRIC CORPORATION, San Francisco, Calif.
ELECTRIC SUPPLIES DISTRIBUTING CO., San Diego, Calif.
MARSHALL-WELLS COMPANY, Portland, Ore.
WOODILL & HULSE ELECTRIC CO., Los Angeles, Calif.

EMERSON FANS

with the 5 year guarantee

Heet-feet Register in Apartment



Heet-feet
Electric Register

NINE SIZES

Small—1000 or 1200 watts
Small—1500 or 1800 watts
Large—2000, 2500 or 3000 watts
Large—3500, 4000

Answer the cry for "More Heat"

These crisp, frost bitten mornings stir up your best salesmen for electric heaters—the apartment tenant who crys for "more heat."

Lots of apartment house owners know the bug-bear of heating—not enough heat to suit thin bloods—too much heat for the fresh-air fiends. And the janitor is in the basement making the furnace roar. What a field this is to tap for Apfel's 100% Electric Heating Systems.

Sell apartment house owners the idea of every tenant his own furnace man. High heat or low heat or no heat at the snap of a switch. Here is the line to sell him with—"Heet-feet" Electric Registers for living room, bedroom, kitchen and both. "100% Electric Radiators" convenient portable radiators made in five sizes.

Get the facts from our nearest representative today.

"Coppersert" Water Heater

$18

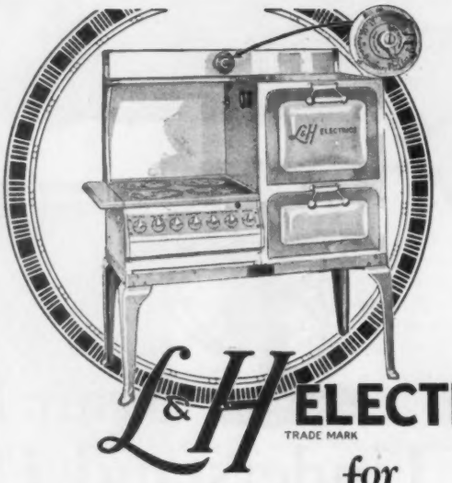
for 600W size

Puts water heaters on a popular sales basis. No extra plumbing. Cannot oxidize. Element sealed, air and moisture proof.

ELECTRIC HEATING & MFG. CO.

Sixth North and Harrison Sts.
Seattle, Wash.

Northern California	Southern California	Washington
O. W. Forsyth	R. Wolfsberg, Inc.	Lynn A. Lougheed
1175 Howard St.	1851 Industrial St.	620 Tacoma Bldg.
San Francisco	Los Angeles	Tacoma



L&H ELECTRICS
TRADE MARK
for
Quick Turnover

The experience of dealers everywhere has proved the fast selling quality of L&H Electrics Ranges. Their handsome appearance and improved features make an immediate appeal to the customer.

The L&H Electrics Range with ***Full Automatic Time and Temperature Controls,*** the rust-proof porcelain enamel finish, the one-piece ovens with rounded corners, variety of choice in sizes and styles are convincing evidence of superiority. To carry the L&H Electrics line means faster turnover—bigger profits.

They are so sturdily built that "servicing" is reduced to the minimum.

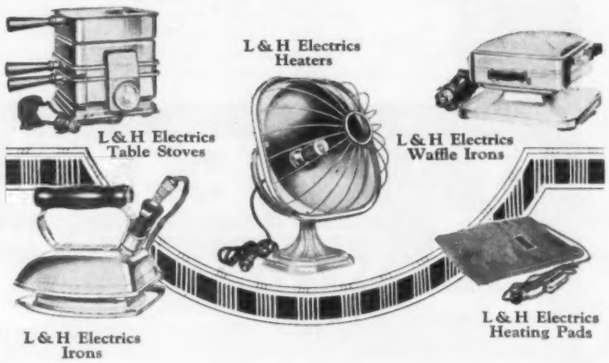
Ask your jobber about L&H Electrics or write to us for information.

A. J. LINDEMANN & HOVERSON CO.
1248 Cleveland Ave. Milwaukee, Wis.

Branches at
Long Beach Building, New York, N. Y.
1636 14th Street, Denver, Colo.
L&H Building, Chicago, Ill.
215 Bryant Street, San Francisco, Cal.

In addition to the articles shown below, our line of Electric Appliances also includes:

Hot Plates	"Turnsit" Toasters	Urn Heaters
Curling Irons	Testing Ovens	Etc., Etc.



You will find a great many people who smilingly walk under a ladder.

And perhaps nothing will ever happen to them.

Then, on the other hand, are you so darn sure?

These are the fellows who stock any old heating appliance just to tempt fate.

And they may get by—

But are you so darn sure?

Isn't it just a wee bit hazardous to take such a chance when - - - "Nichrome" IV - - - is used as the heating element material by so many appliance makers?

DRIVER-HARRIS COMPANY
HARRISON, NEW JERSEY
Chicago Detroit Morristown, N. J. England France

Pacific Coast Distributors
John A. Roebling Sons' Co. of California
San Francisco Los Angeles Portland Seattle

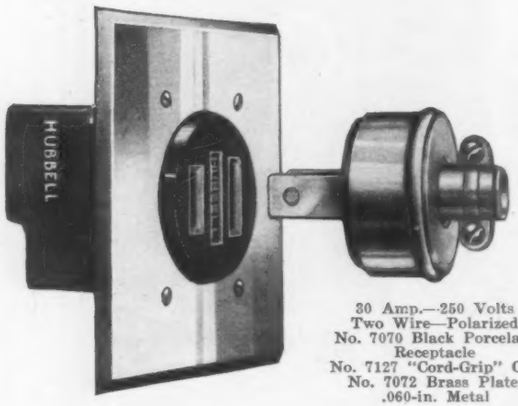
TRADE MARK REG. U. S. PAT. OFF.

Nichrome

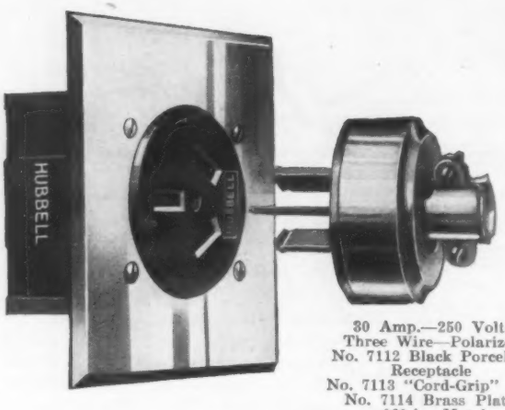
The DRIVER-HARRIS WIRE

HUBBELL

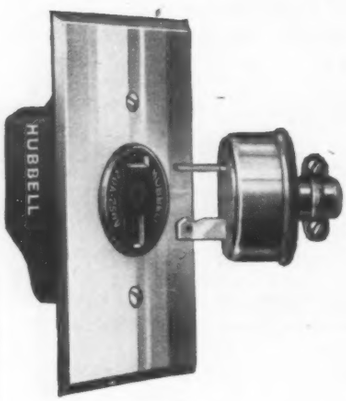
20 and 30 Ampere Flush Receptacles



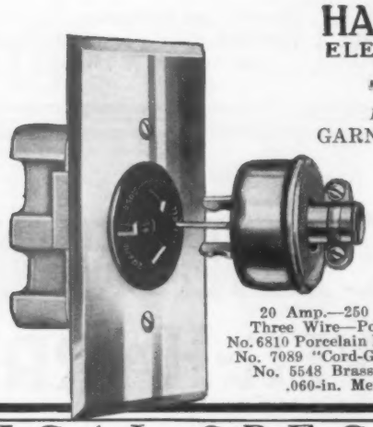
30 Amp.—250 Volts
Two Wire—Polarized
No. 7070 Black Porcelain Receptacle
No. 7127 "Cord-Grip" Cap
No. 7072 Brass Plate, .060-in. Metal



30 Amp.—250 Volts
Three Wire—Polarized
No. 7112 Black Porcelain Receptacle
No. 7113 "Cord-Grip" Cap
No. 7114 Brass Plate, .060-in. Metal



20 Amp.—250 Volts
Two Wire—Polarized
No. 5552 Black Porcelain Receptacle
No. 7058 "Cord-Grip" Cap
No. 5548 Brass Plate, .060-in. Metal



20 Amp.—250 Volts
Three Wire—Polarized
No. 6810 Porcelain Receptacle
No. 7089 "Cord-Grip" Cap
No. 5548 Brass Plate, .060-in. Metal

STRONG—built for hard service

These Hubbell 20 and 30 Ampere Flush Receptacles are built to last. They are strong and rugged throughout.

The receptacles are made of special black porcelain with glazed face. Terminal springs are of heavy phosphor bronze.

The "Cord-Grip" caps are adjustable, accommodating cords of various sizes. They have a heavy "all-over" armor of steel—galvanized to prevent corrosion. Extra-large binding screws. Contact blades of heavy-gauge metal.

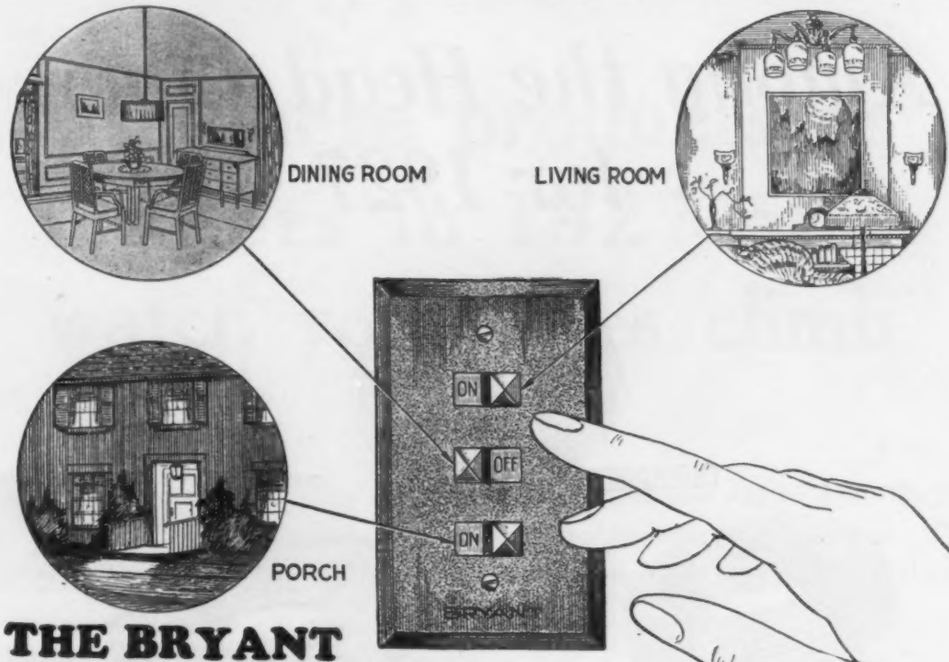
Ask your jobber to show you samples.

HARVEY HUBBELL INC
ELECTRICAL SPECIALTIES
BRIDGEPORT, CONNECTICUT, U.S.A.
NEW YORK, N.Y. CHICAGO, ILL.

Pacific Coast Representative:
GARNETT YOUNG AND COMPANY
San Francisco Los Angeles
Seattle Portland

HUBBELL
REG. U.S. PAT. OFF.

ELECTRICAL SPECIALTIES



THE BRYANT

TRIGLE

TRADE MARK

or Three Circuit Switch in a Single Gang Outlet Box

These devices can be installed in a one gang box, reducing time and material costs to a minimum, but at the same time giving the maximum of service.

The Bryant "Trigle" No. 2860 Switch is a new tumbler device, having three single pole individually controlled switch mechanisms with common feed mounted in one porcelain cup. It has three indicating black composition handles centered vertically on a single gang flush plate.

"Trigle" can be used as a three circuit electrolier switch, that is, for controlling three separate circuits with common feed. For instance, it can control a hall light with one of the handles, another handle operating a light in an adjoining room, and the third a light on the porch.

The same style of switch is also furnished as a two circuit device having two single pole individually controlled mechanisms with common feed. This device is known as No. 2892 and has two black composition indicating handles.

National Electrical Code Standard

THE BRYANT ELECTRIC COMPANY

149 New Montgomery St.
SAN FRANCISCO, CAL.

1421 State Street, Bridgeport, Conn.
New York - 342 Madison Avenue
Chicago - 844 West Adams Street

The largest plant in the world devoted exclusively to the manufacture of Electric Wiring Devices.

BRYANT
SUPERIOR WIRING DEVICES

BRYANT
SUPERIOR WIRING DEVICES

Among the Head Liners for 1927

Speed up with **DURABILT** REG. U.S. PAT. OFF. **PRODUCTS** *Each a Leader in its Line!*

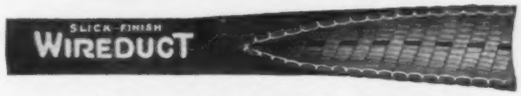
TUBULAR WOVEN FABRIC COMPANY :: PAWTUCKET, R. I.

Pacific Coast Representatives: **ALLIED INDUSTRIES, INC.,** 455 Second St., San Francisco 305 Ninth St., Oakland 1256 Factory Pl., Los Angeles 53 Fourth St., Portland 532 First Ave., South, Seattle

Use these products as leaders in 1927 and watch your sales climb

Guaranteed
Surface Conduit System
Underwriters' Standard

The surest way to increase your business is by helping your customer to solve one of his problems. "If the problem is a surface wiring job WIREMOLD will solve it."



Guaranteed
"Slick-Finish" Loom
Underwriters' Standard

At Last!
Loom With a "Slick-Finish"
Clean to Handle
No Mica Dust
Slick as Ice—Clean as a Whistle
Improved Quality—No Extra Cost
Loom is Loom
But—"Slick-Finish"
Makes WIREDUCT Different

Guaranteed
Non-Metallic Sheathed Cable
Underwriters' Standard

The non-metallic sheathed cable which combines the most exacting requirements of the Underwriters' Laboratories with the greatest convenience of the wiremen. WIREFLEX is also coated with the celebrated "Slick-Finish."

Select your leaders with wisdom and the balance of your line will sell itself.

THE WIREMOLD COMPANY
HARTFORD, CONN.

Western Representative: Geo. A. Gray & Co., 910 Howard Street, San Francisco

Use Paranite because it insures against wire troubles

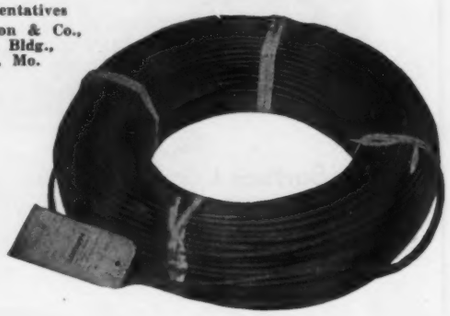
The consistently high quality of PARANITE is the positive assurance of freedom from wire troubles. Certain features make PARANITE easy to handle, thus facilitating each wiring job. The result is absolute economy. PARANITE insulation contains a liberal allowance of rubber. PARANITE is "better than code requires." PARANITE has proved to be the right wire regardless of the wiring job.

Indiana Rubber & Insulated Wire Co.
Jonesboro, Indiana

The Indiana Rubber & Insulated Wire Co., Marquette Bldg., Chicago, Ill.
The Thomas & Betts Co., 63 Vesey St., New York

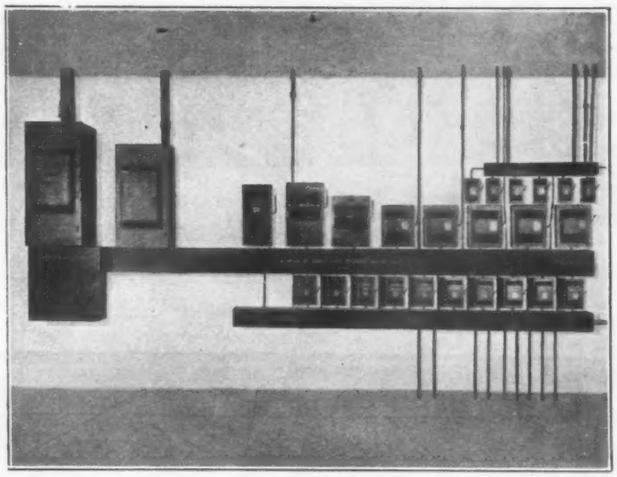
Western Representatives
Walter I. Ferguson & Co., 208 Baltimore Bldg., Kansas City, Mo.

H. F. Boardman, Inc., 600 Hibernian Bldg., Los Angeles, Calif.



If it's
PARANITE
it's right

Electrical West means electrified industries with "Circle T" SAFETY



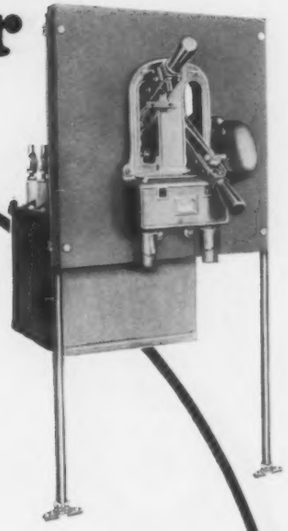
In mine or lumber mill, oil fields or packing plants, and in thousands of Western industries where motor horsepower is increasing volume production, "Circle T" Safety Switches have built up a splendid reputation. For, as electricity has brought speed to these industries, "Circle T" Safety Switches provide the ultimate in safety and dependability. It costs no more to be "Circle T" protected. Ask your contractor or jobber.

A clean-cut safety board of "Circle T" safety switches

Adequate stocks are carried in our Pacific Coast Warehouses.

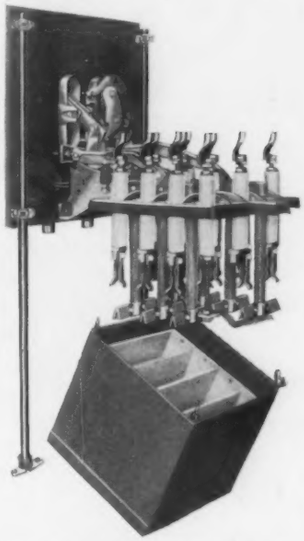
THE TRUMBULL ELECTRIC MFG.CO.
Plainville, Connecticut
Pacific Coast Office & Warehouse -595 Mission St., San Francisco. Representatives - Los Angeles & Seattle

A New Motor-Starting Oil Circuit Breaker



Type MF

Capacity 1,000 hp. at 2,500 volts. Interrupting capacities 1,000 to 7,200 amperes at rated voltages.



MANUALLY operated, for starting, in connection with auto-transformers, three-phase induction motors and self-starting synchronous motors.

A careless, or ignorant operator cannot throw the wrong switch handle when starting the motor. A mechanical sequence-starting interlock prevents throwing the breaker to the running position without first going through the starting position.

Some other distinctive features are:

One tank contains all starting and running connections, immersed in an ample head of oil.

A highly efficient form of wedge and finger-type contacts is used. The fingers are flexibly mounted, therefore self-aligning, exerting high contact pressure by means of a separate stiff-steel spring.

The safety of the apparatus is assured by inverse time limit, automatic overload current-transformer trip coils, and by under-voltage release mechanism, which opens the breaker when the voltage fails.

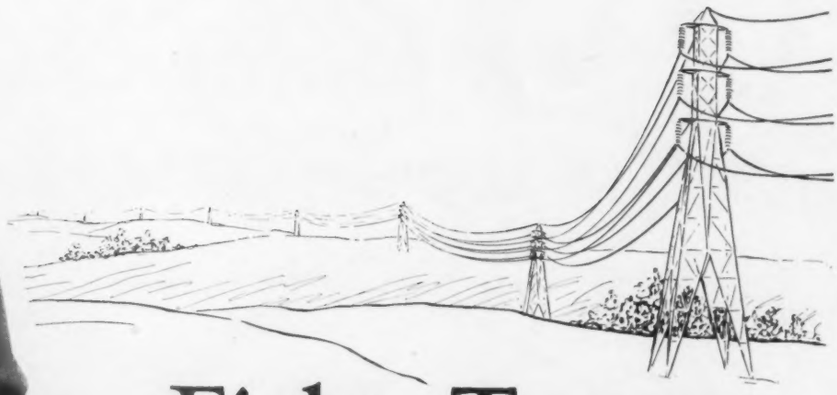
Send for Leaflet 20292; it gives a full description of the MF breaker.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

X90164

No. 631
Recommended Working Load 6000 lbs. Rated Combined M. and E. Strength 18,000 lbs.
Reserve Strength Ratio 3:1



Eight Towers to the Mile Instead of Ten

THE transmission line tendency is toward fewer towers. Will the insulators stand the greater stress? They will, when the greater stresses—multiplied by wind velocities, snow, sleet, and other weather hazards—are provided against in the insulator design and construction.

The requirements of high voltage lines, with their heavier cables, and longer spans, are taken care of in Westinghouse insulators—by reserve strength—just as the towers themselves are provided with extra strength for the extra hazards imposed by *unusual* conditions.

Porcelain you can install *– and forget*

— because science — not tradition—governs the making of all Westinghouse porcelain and insulators.

— precision processes, at every stage, are the rule.

— never is anything taken for granted at any time.

— even slight variations in materials are compensated for.

First the design—then the materials—then the method—and then, a vigilance that permits no compromise.

Westinghouse Electric & Manufacturing Company
Westinghouse High-Voltage Insulator Works
Derry, Pa. Emeryville, Cal.

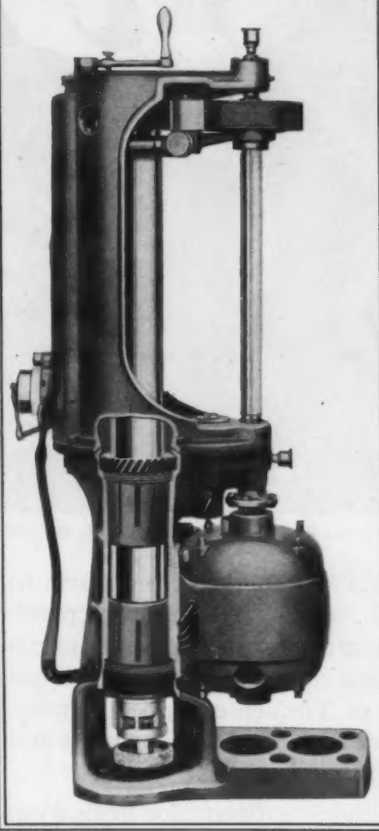
Sales Offices in All Principal Cities of the United States and Foreign Countries X90197

Butte, 52 East Broadway
Casper, Wyo., 124 W. 2nd Street
Denver, 910 Fifteenth Street
El Paso, Mills Building
Fresno, Griffith-McKenzie Bldg.
Los Angeles, 420 S. San Pedro Street
Phoenix, Ariz., 412 Luhrs Bldg.
Portland, 901-2-3 Porter Bldg.
Salt Lake City, So. Temple and W. Temple Streets
San Francisco, 1 Montgomery Street
Seattle, 3451 E. Marginal Way
Spokane, 821 Old National Bank Bldg.
Tacoma, 1117 Rust Bldg.

Insulators with Reserve Strength

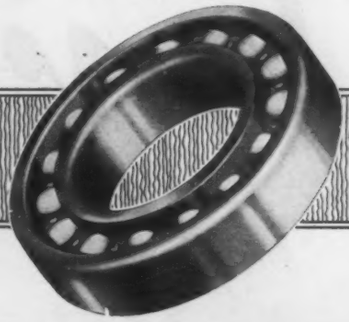
Westinghouse

Simplicity



Ball Bearing Reborer and Cylinder Grinder

The makers of this precision machine have increased the reliability and efficiency at a reduced assembly cost with the application of New Departure Ball Bearings in the motor and throughout the machine.



Bearing and Lubricating Troubles in Vertical Motors Banished by New Departure Ball Bearings

THE inherent adaptability of New Departure Ball Bearings to effective closures and properly designed slingers permits positive sealing in vertical electric motors, keeping lubricant in bearings and preventing leakage into motor windings.

New Departure Ball Bearings have the capacity to resist thrust loads of any kind. They maintain permanently fixed position of shaft, allowing no change of air gap throughout their extremely long life.

They are practically frictionless; therefore, free from wear, requiring no adjustment and less frequent lubrication. Maintenance costs are thereby greatly reduced.

Our engineering department will without obligation make recommendations of proper size and types of New Departure Ball Bearings that will end your bearing troubles. We will gladly send bulletins showing "Ball Bearing Applications to Electric Motors," also booklets "Cutting Your Costs" and "Advantages of New Departure Ball Bearings in Electric Motors" at your request.

The New Departure Manufacturing Company
Chicago Bristol, Connecticut Detroit

New Departure Economies Are Visible in Profits

New Departure Quality Ball Bearings

480

Thrust!

TIMKEN-EQUIPPED ALLIS-CHALMERS VERTICAL MOTOR

Thrust capacity is the first requisite of vertical motor bearings. Absolute dependability is the first requisite of deep well pump drive. Qualifications like these regularly lead to the choice of Timken-equipped motors, available today through Allis-Chalmers and other leading manufacturers.

By providing higher capacity for loads from all directions Timken Bearings provide more than the expected anti-friction economies. To all possible savings of lubricant and power Timkens add the value of extreme overload capacity. In any position on any form of drive Timken Bearings resist all forms of wear equally well. Only Timken Taper and Timken *POSITIVE ROLL ALIGNMENT* make it possible.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

Technical information regarding bearing sizes and mountings is obtainable from the Timken Roller Bearing Service & Sales Company's Branches located in the following cities: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, Newark, New York, Omaha, Philadelphia, Pittsburgh, Richmond, St. Louis, San Francisco, Seattle, Toronto, Winnipeg

TIMKEN
Tapered
ROLLER BEARINGS

ANNOUNCEMENT

Effective January 1st, 1927, the use of the name of the Johns-Pratt Company will be discontinued and the business of that organization will be continued under the name of

Colt's Patent Fire Arms Mfg. Co.

THE dropping of the name of the Johns-Pratt Company and the use of the name of Colt's Patent Fire Arms Mfg. Co. means something more to the electrical industry than just one more change in corporate identity.

To the progress already made by the Johns-Pratt Company in the conception, development and standardization of its electrical products, Colt's brings a background of 90 years' experience in fine manufacturing, a business reputation second to none, and a plant, equipment and financial power which insure an even more progressive schedule of accomplishment than ever before.

This is a change in corporate name only. The trade mark "NOARK", as heretofore, will continue to identify the products with which it has so long been associated.

Colt's Patent Fire Arms Mfg. Co.
Hartford, Connecticut

Boston
New York

Chicago
San Francisco

RIGID CONDUIT

Galvanized and Enameled Types

"XDUCT" "ELECTRODUCT"

In service for over a quarter century
and used in some of the largest and
finest installations in the country.

A sample will show their excellent quality

Mailed on Request

American Circular Loom Company
90 West St., N. Y. C.

Represented in all principal cities throughout U. S.

Represented on the Pacific Coast by: Clapp & LaMoree, Los Angeles and San Francisco; C. R. Dederick, Portland

Buckeye Conduit Preference—

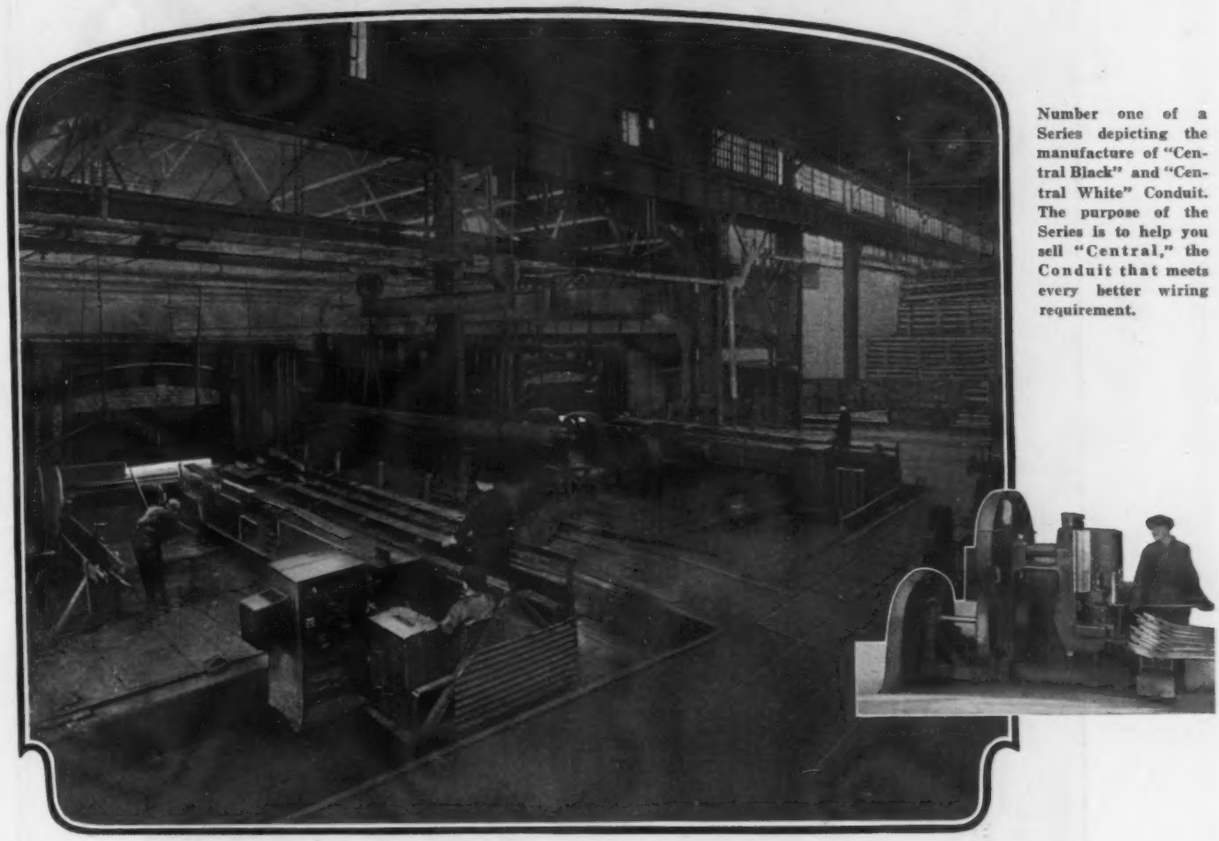
Superiority of manufacture accounts for it. That alone causes Buckeye Conduit to be the most widely used conduit in the world. In most of the buildings of note now under construction on the Pacific Coast, Buckeye Conduit is safeguarding the wiring and reducing installation costs at the same time.

THE YOUNGSTOWN SHEET & TUBE COMPANY
Youngstown, Ohio

Pacific Coast Sales Offices: San Francisco, Sharon Bldg.; Seattle, Central Bldg.

Pacific Coast Distributors: ALLIED INDUSTRIES, INC.

1256 Factory Place, Los Angeles, Calif.
453-455 Second Street, San Francisco, Calif.
532 First Ave. So., Seattle, Wash.
53 Fourth Street, Portland, Oregon



Number one of a Series depicting the manufacture of "Central Black" and "Central White" Conduit. The purpose of the Series is to help you sell "Central," the Conduit that meets every better wiring requirement.

Here is a rear view of Numbers One and Two Butt-Welding Furnaces in the Central Tube Plant, showing how skelp is charged.

The 1st Operation in the Making of "Central" Pipe from which is Made "Central Black" and "Central White" Conduit

Approved by Underwriters' Laboratories

Flat strips or skelp is stored in this building which is 110 feet wide by 700 feet long. The ends of the strips are formed by shears as shown in insert at the extreme right of picture.

Over-head electric cranes carry the skelp to the shears and thence to charging machines shown at the rear of the furnaces.

A charging machine travels back and forth behind each welding furnace, successively charging a cold strip into the furnace as a hot strip is withdrawn from the other end as a welded tube.

The skelp charged onto the flat hearth of the furnace is raised to a temperature of about 2650° F., after which it is drawn into a tube.

CENTRAL TUBE COMPANY

PITTSBURGH

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Here on the famous Ocean Drive at Miami Beach, Florida—the street lighting system is protected by Condex—the better parkway cable.

Better because it lowers first cost by doing away entirely with conduits.

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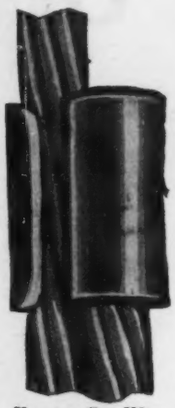

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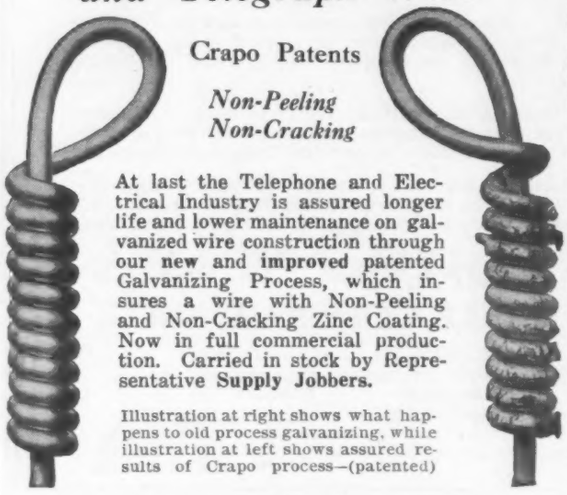

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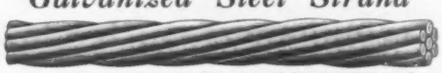
At last the Telephone and Electrical Industry is assured longer life and lower maintenance on galvanized wire construction through our new and improved patented Galvanizing Process, which insures a wire with Non-Peeling and Non-Cracking Zinc Coating. Now in full commercial production. Carried in stock by Representative Supply Jobbers.

Illustration at right shows what happens to old process galvanizing, while illustration at left shows assured results of Crapo process—(patented)

Galvanized Steel Strand



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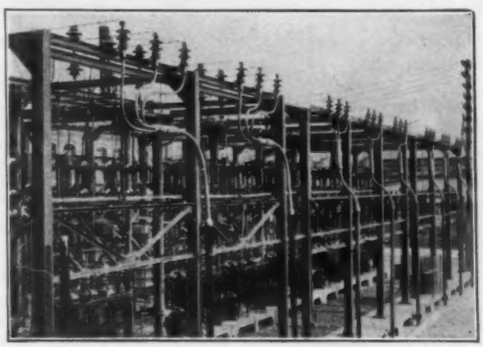

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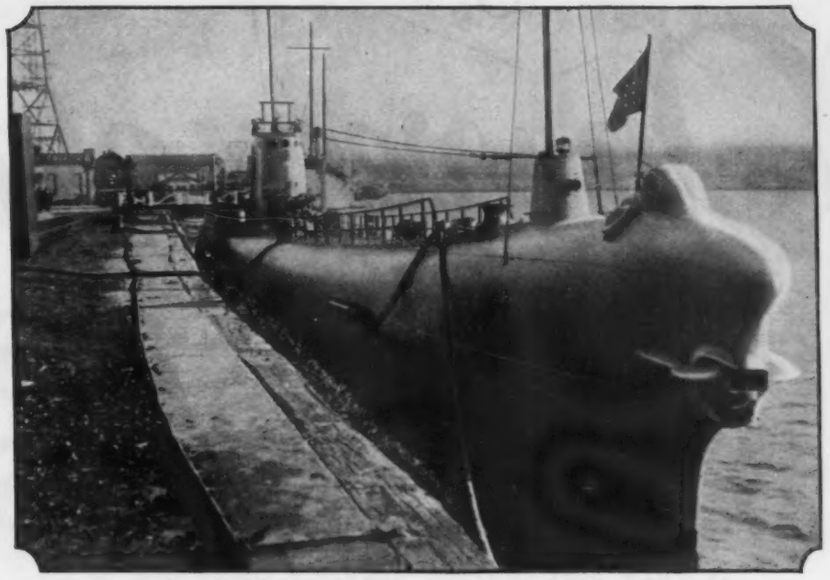

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WHEN the U. S. Submarine V-1 dives undersea, seven officers and eighty men stake their lives on her equipment.

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One year old — 58 years in business

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But behind company and tag were more than half a century of experience; first as Gray and Barton, later as the Western Electric Supply Department, distributor of everything electrical.

Sixty thousand items are the sum total shipped under the Graybar tag—the symbol of a distributing service that operates wherever electricity lightens burdens, speeds up work or increases comfort.

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Electrical Supplies

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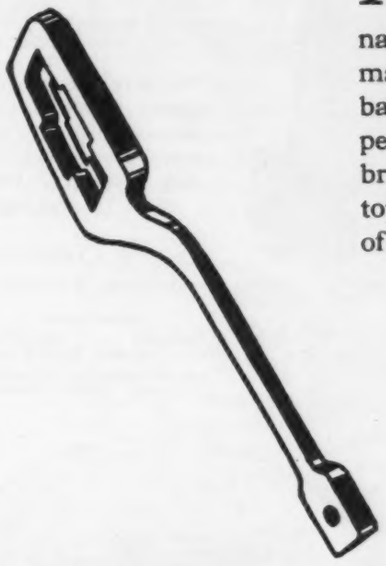

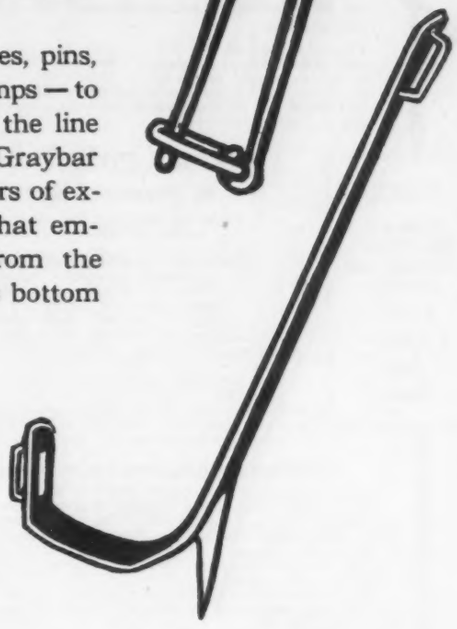

58 Years in back of them

INSULATORS, poles, pins, climbers and clamps — to name a very few of the line material items that Graybar backs up with 58 years of experience. Supplies that embrace "everything from the top of the pole to the bottom of the hole"!

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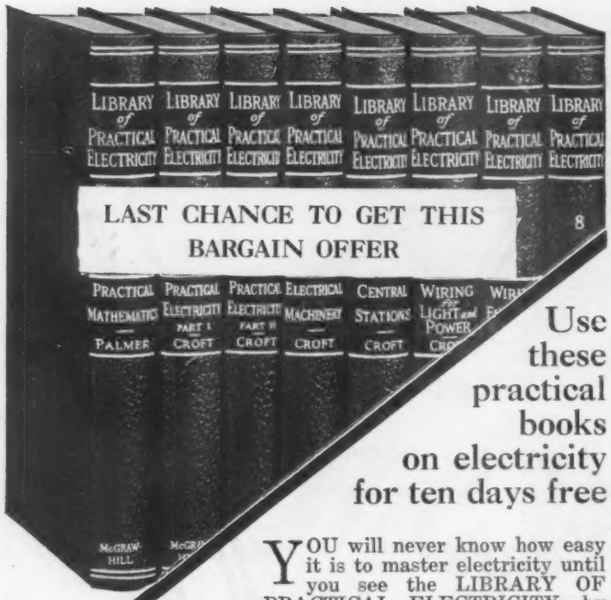
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Our improved straight shovel (absolutely straight from end to end) is an example of our ability to bring out the most efficient designs. This shovel makes it easier to straighten and keep holes uniform.

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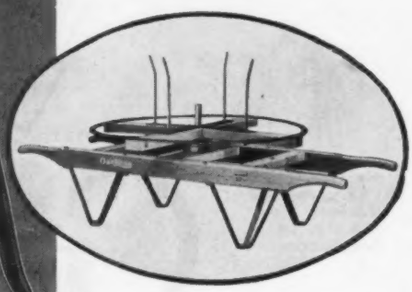
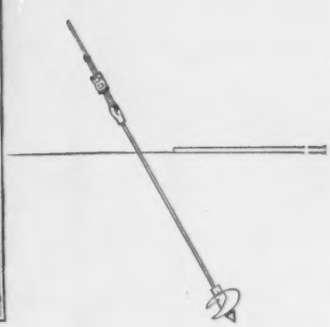


OSHKOSH POLE LINE CONSTRUCTION TOOLS



Under the Pavement

But no digging was necessary to put it there

Think of the time and money saved on this installation. Not necessary to use a stub so that the guy wire would clear the walk; no digging or excavating necessary —all because a Matthews Scrulix Anchor was on the job. Two men screwed it down in a few minutes. Tons of earth keep it in place. See how Matthews Scrulix Anchors will save you installation costs and assure dependable protection for your pole lines. Send for Bulletin 800.

Many Advantages

Easy to install—simply screw them down. In hard pan, shale, loam, anywhere, it's all the same to Matthews Scrulix Anchors. They come assembled in one piece; nothing to become lost or buried unadjusted. Made in 7 sizes. A size for every anchoring need. Neat installations can be made in flower beds or lawns.

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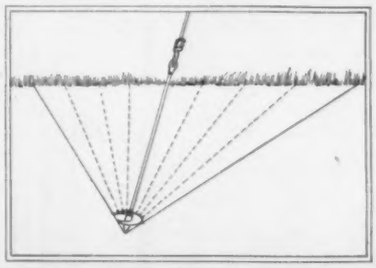
The Scrulix Anchor Helix is so designed that instead of depending merely upon the column of earth covering the helix, for holding power, it brings into play hundreds of cubic feet of earth around it. Under strain the lines of force radiate from the contour of the anchor helix at a 45 degree angle. This is the explanation of their almost unbelievable holding power.



Get Complete Information

Write for Bulletin 800. It illustrates and covers in detail the many ways that companies in every part of the world have satisfactorily solved the most difficult of anchoring problems.

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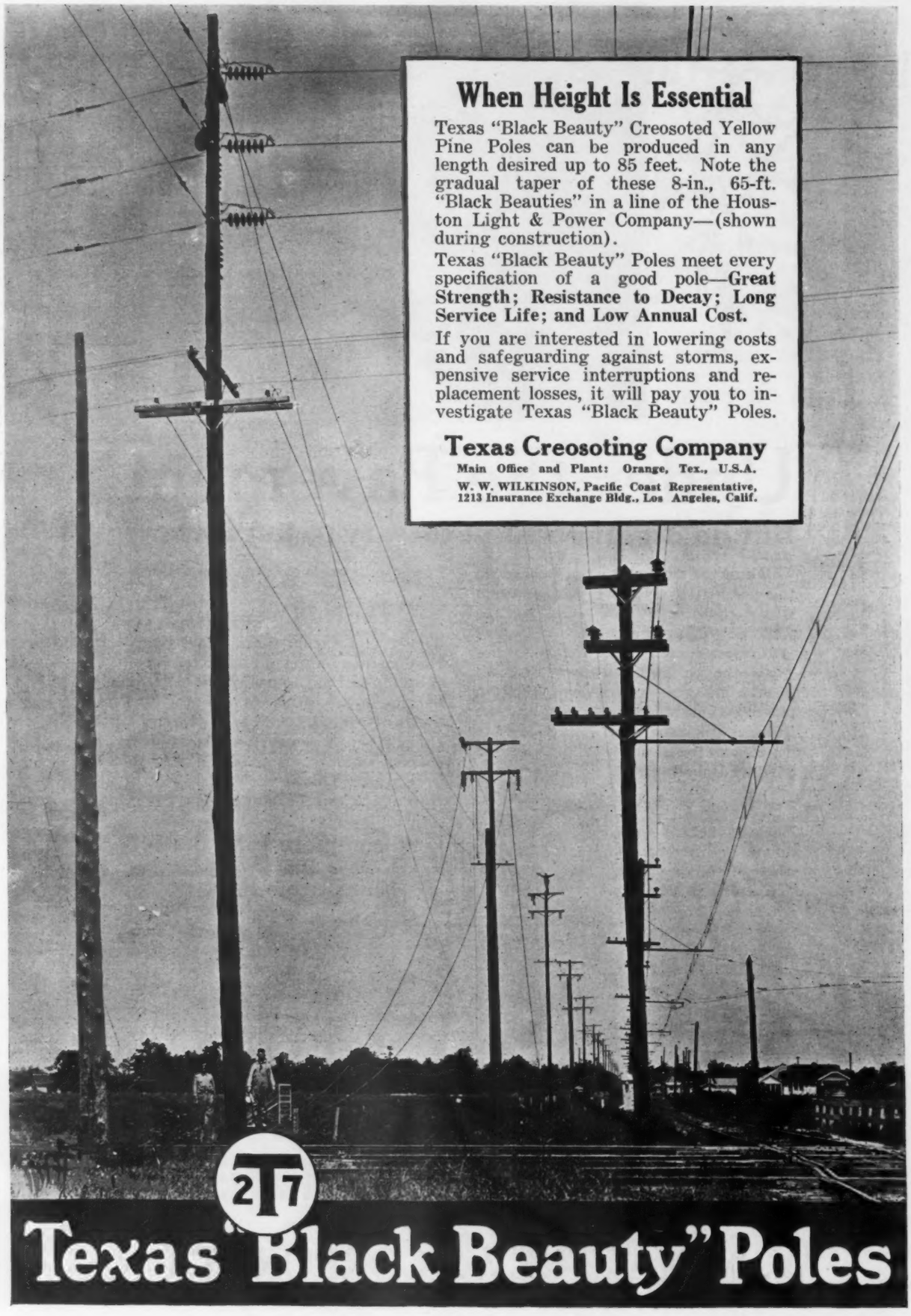
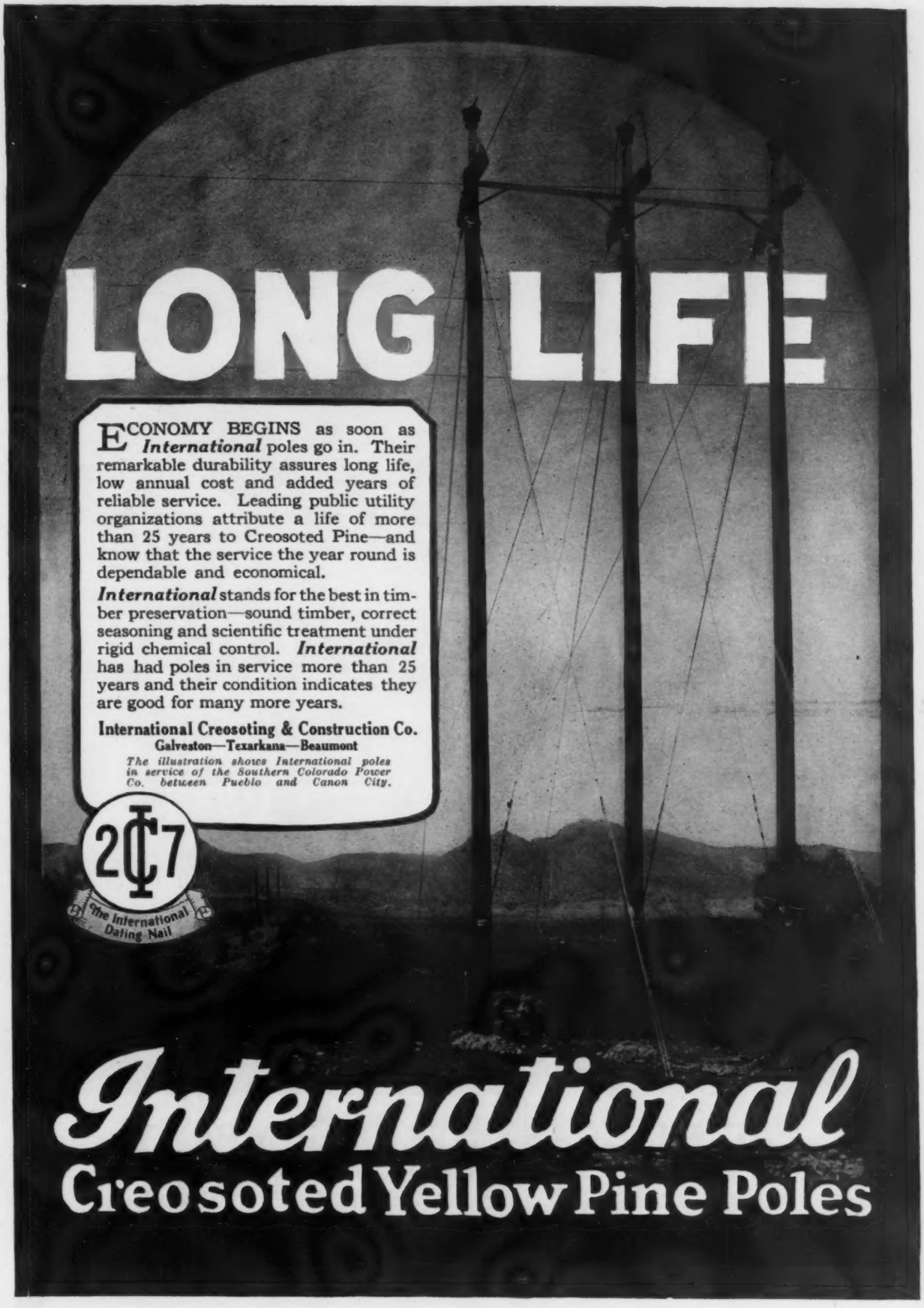
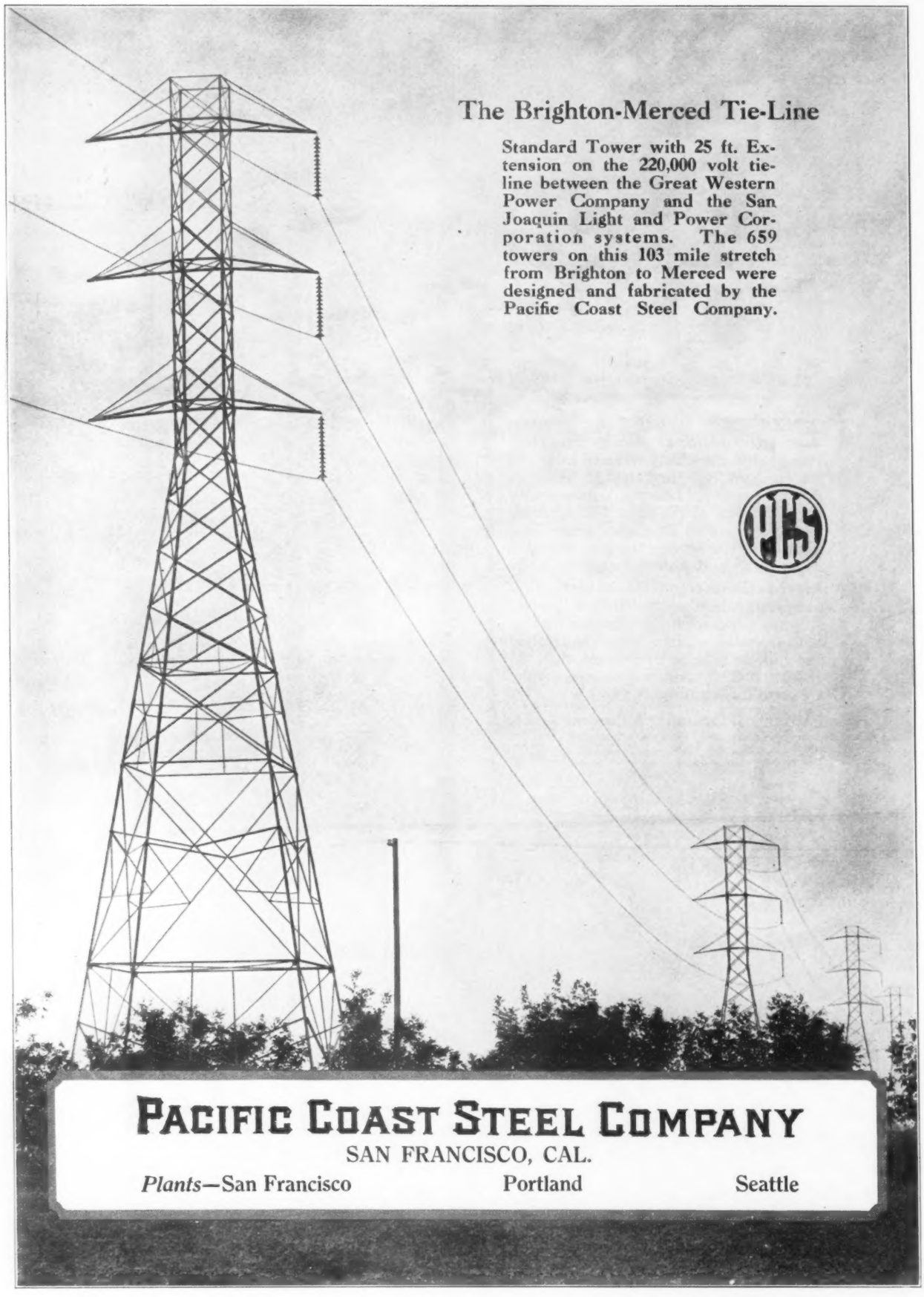
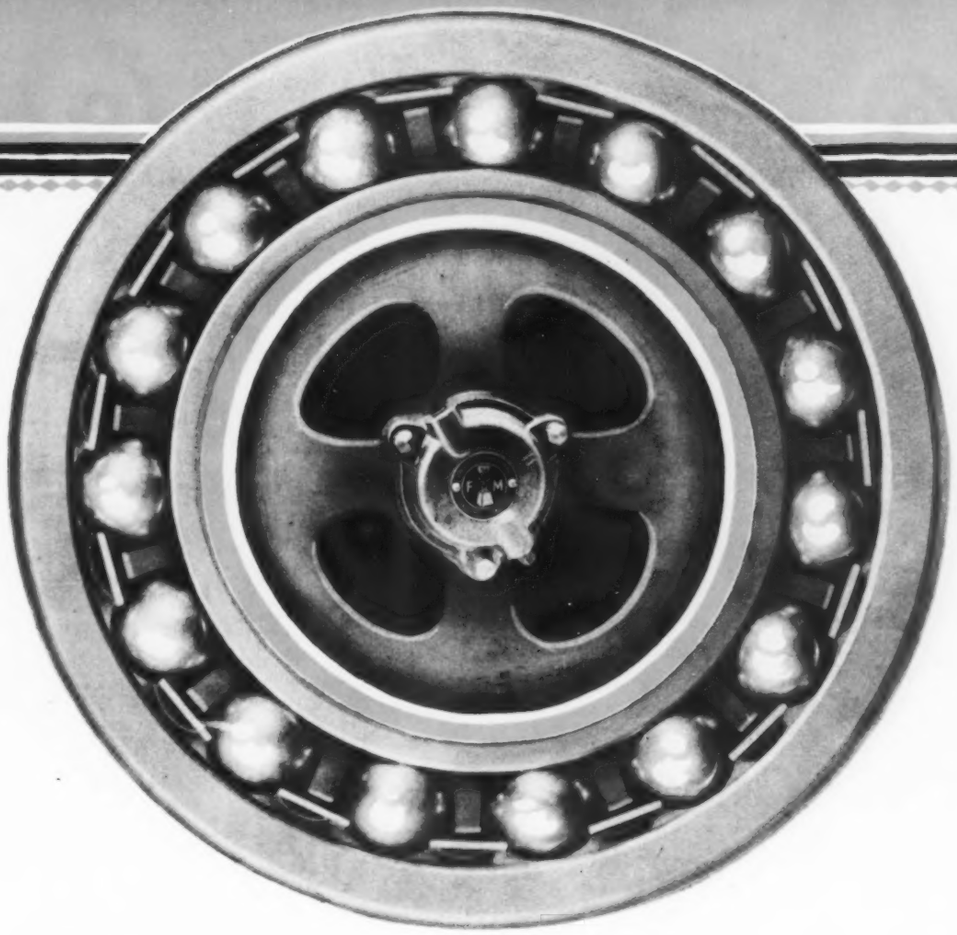

When Height Is Essential
Texas "Black Beauty" Creosoted Yellow Pine Poles can be produced in any length desired up to 85 feet. Note the gradual taper of these 8-in., 65-ft. "Black Beauties" in a line of the Houston Light & Power Company—(shown during construction).
Texas "Black Beauty" Poles meet every specification of a good pole—Great Strength; Resistance to Decay; Long Service Life; and Low Annual Cost.
If you are interested in lowering costs and safeguarding against storms, expensive service interruptions and replacement losses, it will pay you to investigate Texas "Black Beauty" Poles.
Texas Creosoting Company
Main Office and Plant: Orange, Tex., U.S.A.
W. W. WILKINSON, Pacific Coast Representative, 1213 Insurance Exchange Bldg., Los Angeles, Calif.
2T7
Texas "Black Beauty" Poles


LONG LIFE
ECONOMY BEGINS as soon as International poles go in. Their remarkable durability assures long life, low annual cost and added years of reliable service. Leading public utility organizations attribute a life of more than 25 years to Creosoted Pine—and know that the service the year round is dependable and economical.
International stands for the best in timber preservation—sound timber, correct seasoning and scientific treatment under rigid chemical control. International has had poles in service more than 25 years and their condition indicates they are good for many more years.
International Creosoting & Construction Co.
Galveston—Texarkana—Beaumont
The illustration shows International poles in service of the Southern Colorado Power Co. between Pueblo and Canon City.
2IC7
The International Dating Nail
International
Creosoted Yellow Pine Poles


The Brighton-Merced Tie-Line
Standard Tower with 25 ft. Extension on the 220,000 volt tie-line between the Great Western Power Company and the San Joaquin Light and Power Corporation systems. The 659 towers on this 103 mile stretch from Brighton to Merced were designed and fabricated by the Pacific Coast Steel Company.
PCS
PACIFIC COAST STEEL COMPANY
SAN FRANCISCO, CAL.
Plants—San Francisco Portland Seattle



This pioneering step

has made most motor failures inexcusable

Statistics are not available, but your own experience will tell you that the great majority of motor troubles and failures are directly traceable to bearings.

Fairbanks-Morse recognized this fact first. Brought out the first complete line of general purpose *ball-bearing* motors. Replaced the time-honored sleeve-bearing with a trouble-eliminating ball bearing. Made most all motor failures inexcusable!

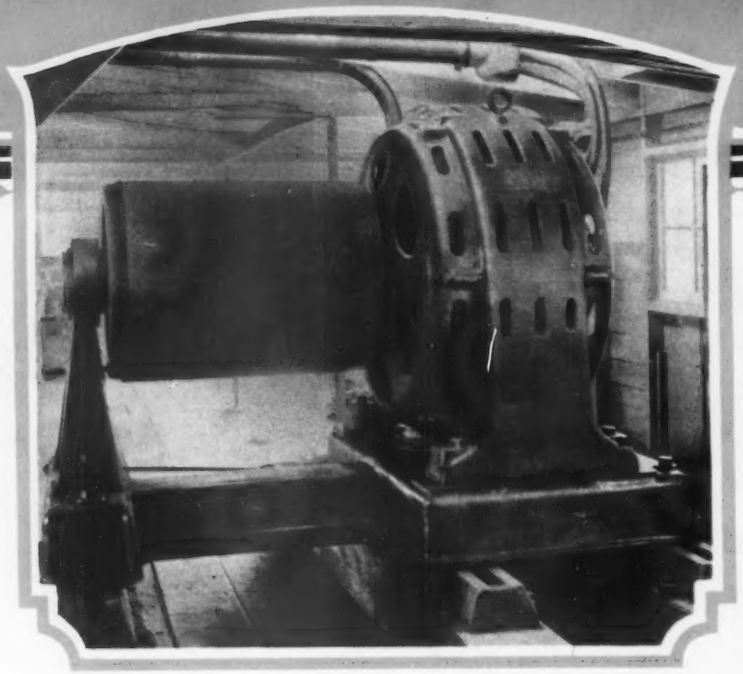
If this were the one contribution of Fairbanks-Morse to motor progress, it would still stand out as the greatest recent step in motor development. Actually it is only one of a number of great features that have been developed in F-M Ball-Bearing Motors.

One motor is better than the Fairbanks-Morse Sleeve-Bearing Motor. It is the Fairbanks-Morse Ball-Bearing Motor.

FAIRBANKS-MORSE

Pioneer Manufacturers of

ball bearing motors



Know how well a motor can serve

Herbert Hoover's plea for "making machinery sweat instead of workmen" applies particularly to motors. The motor that does not live up to the reputation for dependability established by electrical machinery breaks faith with this modern conception of production.

F-M motors have won a reputation for mastering severe working conditions. Overload capacity and conservative rating are typical "safety factors" of these motors. Short, rigid shafts provide for heavier stresses than those arising in service. Sturdy frames that stay put make F-M motors equal to the most difficult drives. Jointless one-piece rotors and tough durable insulation that will not harden or crack are typical *plus* features.

Such motors more than meet the demands of modern production.

This booklet, "Motors in All Kinds of Service," will give you a new conception of how well a motor can serve. Write for it.

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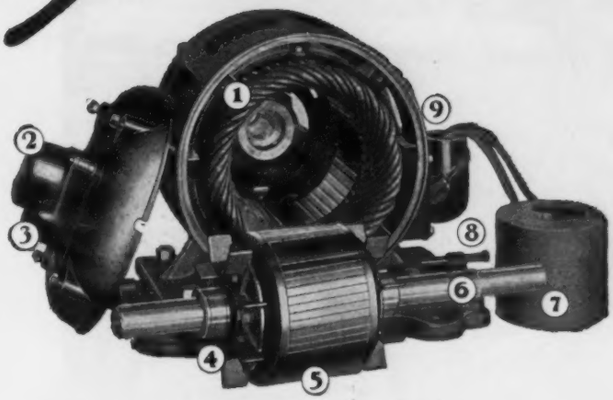
9 Vital Points that mean long trouble-free service



1. Pre-treated wire used in the winding; coils easily repaired or replaced.
2. Dust-proof ring oiling bearings carried by substantial end heads.
3. Large oil reservoir with spring hinged cover, drain plug and overflow.
4. Two fans assure thorough ventilation.
5. Rotor well balanced; note large shaft and general rugged design.
6. Bearing surfaces are accurately ground.
7. Paper pulley insures minimum slip, therefore longer belt life.
8. Simple adjustment of belt tension. One screw on each end of sliding base.
9. Conduit terminal box can be turned up or down or to either side; separable cover gives quick access to connections.

These nine vital points make R & M Polyphase Induction Motors stand out as being superior for every class of service. Regardless of the type of machine to be driven, there is an R & M Motor that will give the desired power with reserve capacity and low cost upkeep.

Type "L" Polyphase Induction R & M Motors are available in ratings from 1 to 75 H. P.

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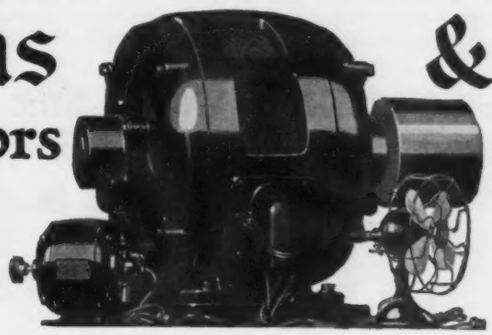
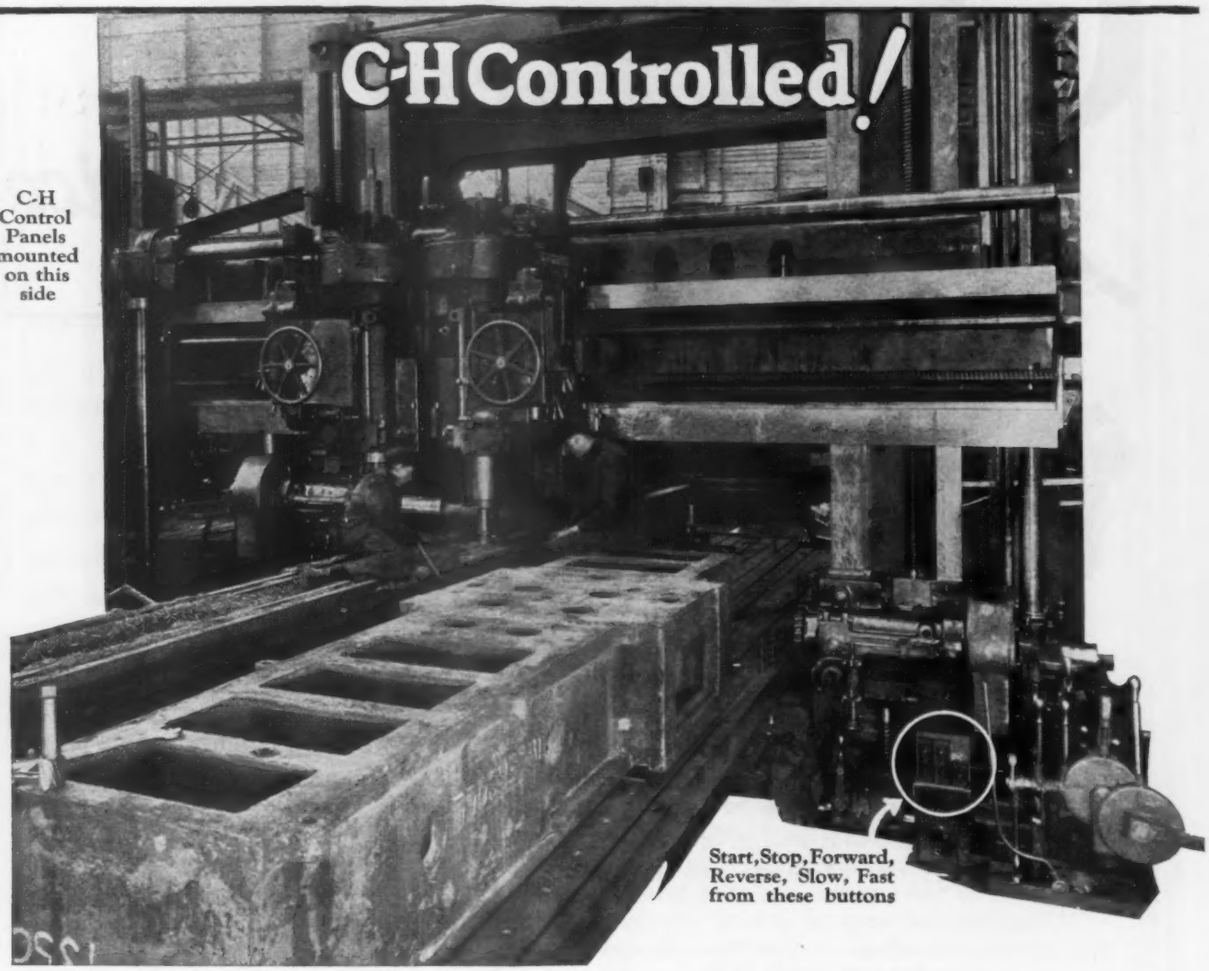
Robbins & Myers Motors and Fans



America's largest milling machine—

C-H Controlled!



THIS gigantic Ingersoll Milling Machine —the largest ever built in America— takes a casting 10 ft. wide, 8 ft. high, and 36 ft. long and has two cross-rails and two side heads. One 100 h. p. motor for driving the spindles and one 30 h. p. motor for the power feeds and adjustments are used.

Big?—yes, but Cutler-Hammer Motor Control gives a surprising sensitivity and accuracy. With over a 60 ton load, the table can be moved with the rapid traverse as little as .015 in. at atime or at a steady rate of 25 ft. per minute.

By incorporating C-H Control as an integral part of their machines, manufacturers effect centralized control within close limits, economy of operators' time and increase production periods. Consider these features in relation to the saleability of your product.

C-H engineers will be glad to consult with you as to the practical application of C-H Motor Control to your product. You will not be obligated by accepting this service. A worthwhile improvement may result.

The CUTLER-HAMMER Mfg. Co.

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Industrial Efficiency Depends on Electrical Control

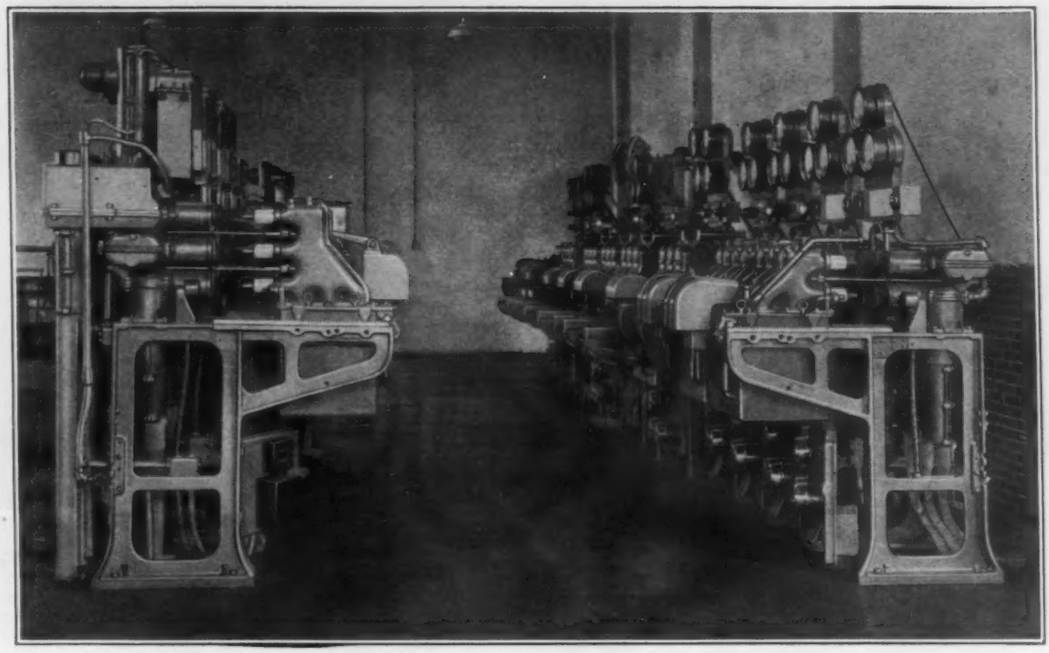
THE
Public Service Company of Northern Illinois

insures

Safety to Their Employees,
Continuous Service to Their Customers

by using

Reyrolle-Armorclad-Switchgear



Public Service Company of Northern Illinois
BELLWOOD SUB-STATION—BELLWOOD, ILL.

Allis-Chalmers-Reyrolle Switchgear provides—
The maximum of safety and reliability and requires a minimum of space and attention.

Send us your next inquiry for switching equipment.

Descriptive Leaflet No. 2085 will be gladly sent on request.

ALLIS-CHALMERS
MILWAUKEE, WISCONSIN

STAUNCH

Type D-13C

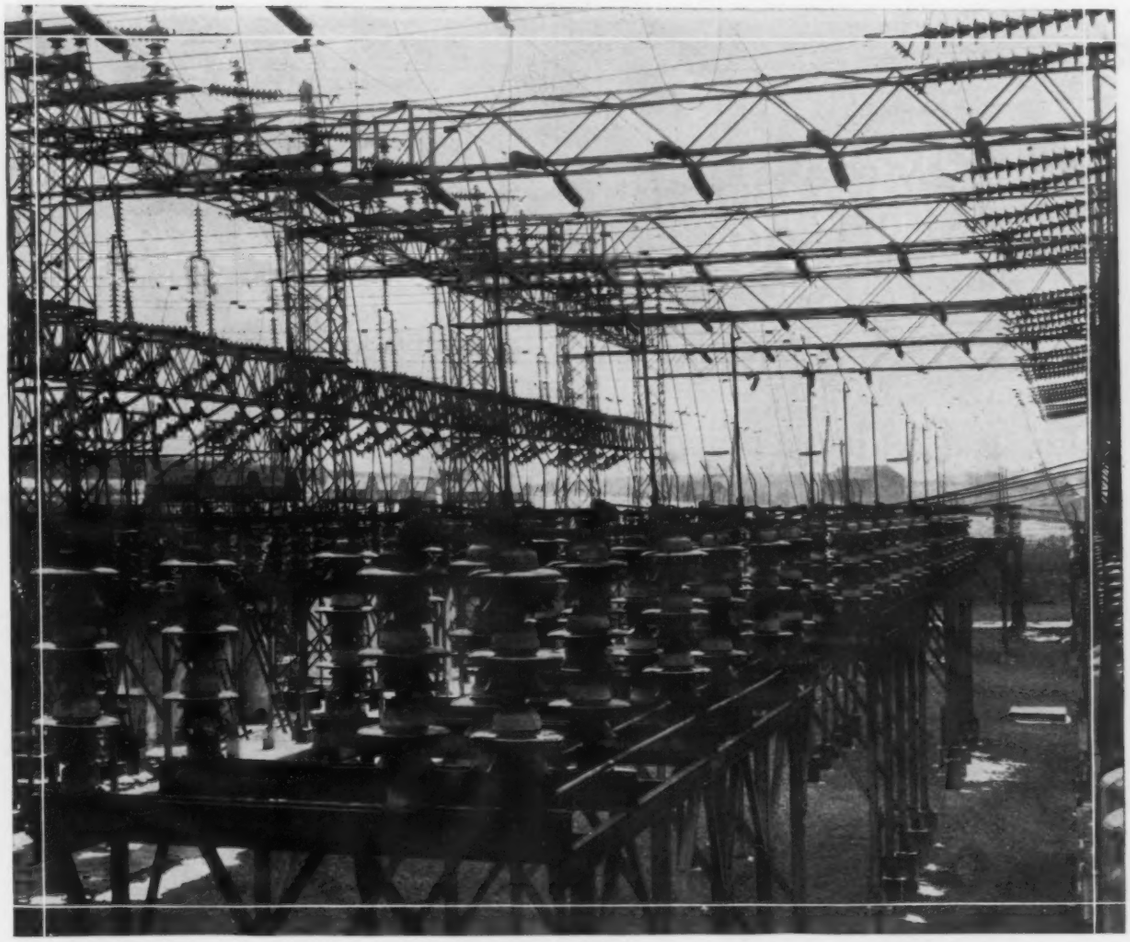
—and firm on its solid foundation, the lighthouse calmly endures the onslaughts of storm driven seas.
It is the same principle of solid foundation applied to the Condit type D-13 C Oil Circuit Breaker in its staunch and rigid steel frame that enables it to withstand the stresses and strains encountered in the interruption of high power circuits.

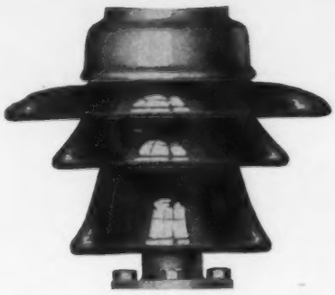
CONDIT ELECTRICAL MFG. CORPORATION
Manufacturers of Electrical Protective Devices
Boston, Mass.
Represented by
H. B. SQUIRES COMPANY,
Seattle, San Francisco, Los Angeles

SPECIFICATIONS: *1, 2, 3, and 4 pole, manually and electrically operated, 1200 amperes or less, 15000 volts, 600 amperes or less, 25000 volts. Interrupting capacity 2700 amperes at 15000 volts.*

CONDIT

474





In the interest of prompt service to Pacific Coast Customers, stocks of O-B materials are carried continuously in San Francisco and Los Angeles.

Switches that Switch

THE switch manufacturer who made this impressive group of air-break switches, and the engineering staff of the important power system using them, did not minimize the part that reliable insulation must play in protecting the large investment in materials and equipment.

The insulators on switches must be equal electrically to the insulation on other parts of the system. They must be mechanically reliable to maintain the switches in operative condition over a period of *many years* and under all conditions. A switch that will not switch is not a switch.

By using O-B No. 26085 switch assemblies, these two companies have indicated their confidence in O-B porcelain, a confidence inspired by consistently reliable performance of many insulators for many years.

Experimentation—trial were out of place in face of the responsibility involved.

San Francisco
215 Market St.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
267H

Los Angeles
417 S. Hill St.

Ohio Brass Co.

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

FOG INSULATORS

For use in districts where salty atmosphere, fog and dirt decrease insulator security

LAPP FOG INSULATORS are designed to meet the most unusual conditions of service. Every test to which they have been subjected has proved their fitness for the purpose. Flashover and leakage distance comparisons with standard units, under every conceivable difficulty, have produced most satisfactory results.

Made in both pin and suspension types to meet all the electrical and mechanical requirements of high-voltage power transmission.

Complete Information about Lapp Fog Insulators on Request. Tell Us the Details of Your Fog or Dirt Troubles

FOG INSULATOR
No. 5805

10 5805's (right) contrasted with 12 No. 2300's (standard) show more than 30 per cent more leakage distance, 56 per cent per unit. Insulators covered with cement dust.

THE LAPP INSULATOR CO., INC.

LE ROY, N. Y., U. S. A.

Represented by

VAN ROSEN COMPANY
141 Milk Street
Boston, Mass.

HARRIS & BUTLER
Real Estate Trust Bldg.
Philadelphia, Pa.

W. D. HAMER CO.
518 Traction Terminal Bldg.
Indianapolis, Ind.

S. H. LANYON
509 New Call Bldg.
San Francisco, Cal.

ENGINEERING MDSE. SYND.
Joyce Realty Bldg.
Columbus, Ohio.

SHIELD ELECTRIC CO.
149 Broadway
New York, N. Y.

HENRY N. MULLER CO.
2204 1st National Bank Bldg.
Pittsburgh, Pa.

J. E. SUMPTER CO.
Security Bldg.
Minneapolis, Minn.

O. H. DAVIDSON EQUIP. CO.
1633 Tremont St.
Denver, Colo.

TRANSELECTRIC CO., INC.
360 N. Michigan Ave.
Chicago, Ill.

UNION ELECTRIC CO.
933 Liberty Ave.
Pittsburgh, Pa.

J. K. WEBB
1521 Commerce St.
Dallas, Tex.

J. W. FRASER & CO.
Charlotte, N. C.

INDUSTRIAL SUPPLY CO.
Brown Marx Bldg.
Birmingham, Ala.

POWER MACHINERY CO.
301 Dwight Bldg.
Kansas City, Mo.

LAPP INSULATORS DO NOT FAIL

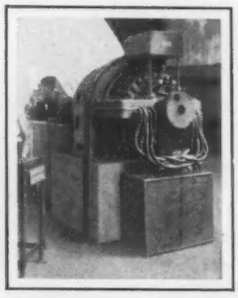
THE SYMBOL OF SERVICE

Compression, Cantilever-Tension and Torsion. These are the forces which, singly and in combination give constant menace to insulators for apparatus supports, switches and other station uses. Usually having more metal parts and cemented joints with bigger masses of materials involved than in other types of insulators, considerations of thermal capacity, expansion and contraction must be correlated to give safe operation under all temperature and load conditions. The Locke "Steam Cured" process provides the most positive measure of protection known. Locke Station Insulators are without limit as to variety of designs for all uses and they are the popular and scientific choice the world over.

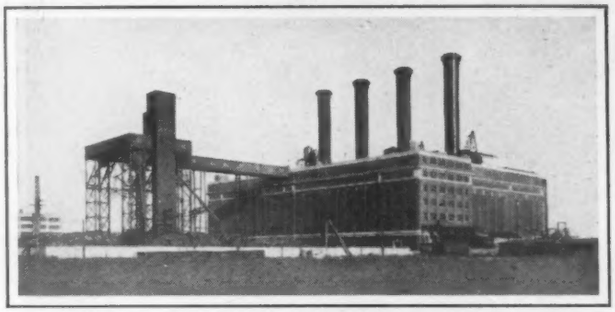
Process Patented

LOCKE INSULATOR CORPORATION
Baltimore, Md.
Factories at Victor, N.Y. and Baltimore, Md.

Established LOCKE PORCELAIN 1894



Protecting the draft



ENGINEERS who visit the new Hell Gate Station of The United Electric Light and Power Company, New York, always pay particular attention to the efficient draft system for the boilers. Twenty-one fans each of 140,000 cu. ft. per minute capacity for induced draft and sixteen each of 120,000 cu. ft. per minute for forced draft were furnished by the B. F. Sturtevant Company. Each fan is driven by a BTS brush shifting polyphase motor of approximately 200 HP, manufactured by the General Electric Company. These fans must run with absolute dependability of speed control, for on the mathematical precision of their performance depends a large part of the economy realized by the boilers of this immense station, whose capacity will soon be increased to 445,000 KW.

To assure the reliability of these draft motors throughout the wide range of speed at which they must operate, our brushes were chosen. NCC grade 259 is used on the forced draft fan motors. Grade R-14, made by our Corliss Division, is installed on the induced draft fan motors. These brushes have fulfilled every expectation since the day the station was opened. Work is proceeding on the installation of the 160,000 KW American Brown Boveri turbo-alternator (double the size of the next largest unit built in this country) with full confidence that when its demands come upon the boilers the draft system will perform just as perfectly at full load as it does now, with only the Westinghouse and G. E. equipment installed.

NCC brushes are available for all who generate, convert or utilize electric power, for the protection of the service and the assurance of economy. Our Sales Engineers are at your call and will assist you in selecting the proper brushes for your machines.

National
Pyramid Brushes

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division
Cleveland, Ohio San Francisco, Cal.
Unit of Union Carbide and Carbon Corporation

Emergency Service Plants
CHICAGO, ILL., 551 West Monroe St. Phone: State 6092
PITTSBURGH PA., 7th Floor, Arrott Power Bldg. No. 3, Barker Place. Phone: Atlantic 3570
NEW YORK, N. Y., 357 West 36th St. Phone: Lackawanna 8153
BIRMINGHAM, ALA., 1824 Ninth Ave., N. Phone: Main 4016

Regular Now---

WESTON RECTANGULAR SWITCHBOARD INSTRUMENTS

THE case design of this group of Weston switchboard instruments was unique. It was a radical departure from recognized switchboard design, giving space savings combined with unusual scale readability. Yet because it was an innovation originating with Weston and because it so completely filled the modern switchboard need *it is regular now and everywhere* being specified.

PACIFIC COAST REPRESENTATIVES

Graybar Electric Company, Inc.
84 Marion Street,
Seattle, Wash.

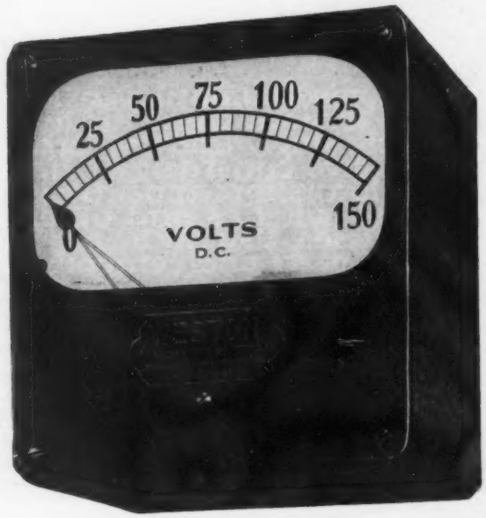
A. A. Barbera
Los Angeles, Calif.

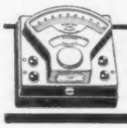
J. H. Southard
San Francisco, Calif.

Repair Service Laboratory
682 Mission Street
San Francisco, Calif.

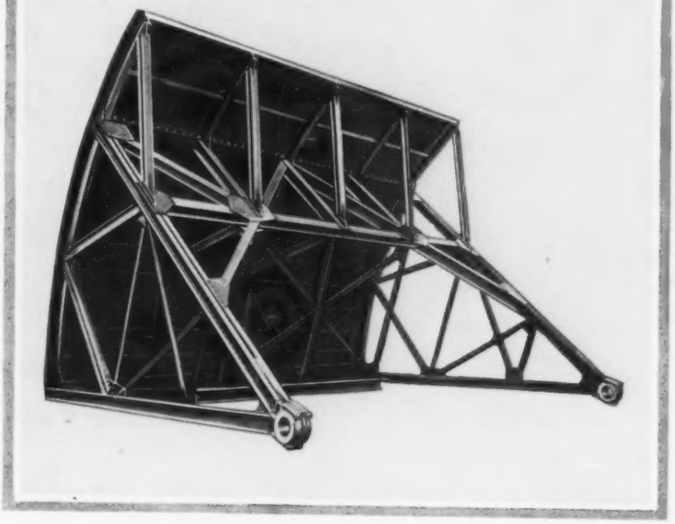
WESTON RECTANGULAR INSTRUMENTS are provided as A.C. Ammeters, Voltmeters and Wattmeters, Re-Active Component Meters, Frequency Meters, Power Factor meters, Triplex Ammeters and D.C. Voltmeters and Ammeters. Unusually legible scales. Standardized mountings and greater economy of switchboard space.

WESTON ELECTRICAL CORPORATION
12 Weston Avenue,
Newark, N. J.





STANDARD THE WORLD OVER
WESTON
Pioneers since 1888



TAINTER GATE FOR COLUMBUS ELECTRIC & POWER CO.

THIS is one of 19 large Tainter Gates built at Newport News for Stone & Webster, Inc., designers and constructors of the Bartlett's Ferry Development of the Columbus Electric & Power Company. Each gate is 23 ft. high by 25 ft. wide, weighing approximately 24 tons.

Difficult plate work, where accuracy is essential, such as a Tainter Gate, is exactly the sort of thing that this great shipbuilding plant is schooled in; used to building ships to template. Flood gates, Tainter Gates, and their operating mechanism, etc., built at Newport News are therefore characterized by unusual accuracy and operating effectiveness.

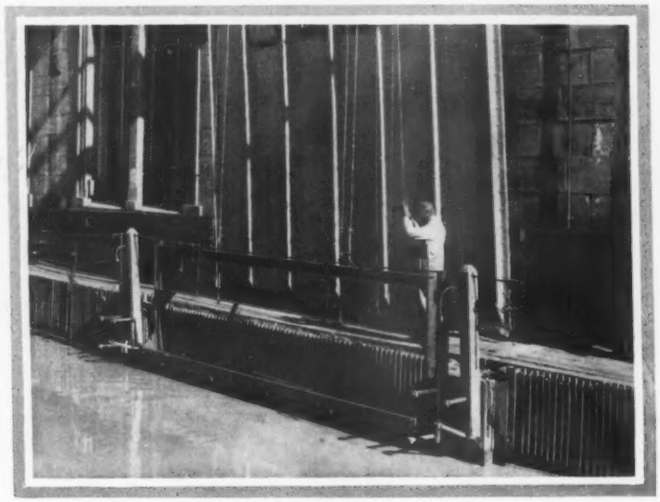
If you will address us on your business letterhead we will be glad to send you an interesting book on hydro-electric equipment: "Beating Swords into Plowshares."

HYDRO-ELECTRIC DIVISION
NEWPORT NEWS SHIPBUILDING AND DRY DOCK CO.
NEWPORT NEWS, VIRGINIA - CHARLOTTE, N. C. - NEW YORK: 233 BROADWAY
SAN FRANCISCO AND LOS ANGELES: Water Works Supply Company
SEATTLE: Water Works and Power Equipment Company

ECONOMY

DUE to the fact that ship machinery and hydro-electric equipment bear the same mechanical characteristics, it means that your turbines, penstocks, towers, etc. are built with utmost economy in a plant where there is no idle machinery to take its toll of overhead.

The experienced engineering staff of the Hydro-Electric Division has at its command unsurpassed facilities.



A NEWPORT NEWS MECHANICAL RACK RAKE AT THE 12TH STREET STATION OF THE VIRGINIA ELECTRIC & POWER COMPANY. AN EARLY INSTALLATION, DESIGNED FOR LIMITED SPACE.

The Watch Dog in the Fore-bay

NEWPORT NEWS Mechanical Rack Rake

IT'S no longer necessary to rely on the time-honored hand rake and grappling hooks to keep your racks free of debris and trash brought down into the fore-bay.

With this simple installation, one man operating the controls can assure full water at all times. It is a simple matter to drop the rack rake to the bottom of the rack, and by power raise to the top all the accumulated trash. By the use of the log hooks, heavy sunken logs are easily brought to the surface.

This method eliminates hand labor, gives positive cleaning, and assures full water in the penstock as long as there is water in the fore-bay.

Write today for book which tells the story of this mechanical rack rake. It is a positive economy.

HYDRO-ELECTRIC DIVISION
THE NEWPORT NEWS SHIPBUILDING & DRY DOCK COMPANY
NEWPORT NEWS, VIRGINIA - - NEW YORK, 233 BROADWAY

TRANSMISSION TOWER

OPEN FLUME TURBINE FOR PENOBSCOT POWER CO.

Model M2S singlephase meter

Duncan Switchboard Watthour Meters

Model M2PA polyphase meter

Duncan Alternating Current Switchboard Watthour Meters are essentially the same as the well-known Model M2 service type meter, but modified to meet the conditions of switchboard usage. Consequently they have the same high quality of construction and performance. For accessibility and ease of adjustment they are unexcelled. The Models M S and M2PS present a neat and handsome appearance on the switchboard, the standard finish being hard rubber black and polished nickel. Other finishes can be furnished, however, if desired.

Model M2PS polyphase meter

DUNCAN ELECTRIC MANUFACTURING CO.
Lafayette, Ind.

A. F. BLECKSMITH, 547 Douglas Bldg., Los Angeles
GEORGE L. HOFFMAN, 202 Oregon Bldg., Portland

DUNCAN
Watthour Meters

Y-26
STANDARDIZED
NEMCO
MICA PRODUCTS
HIGH-HEAT MICA PLATE
REG U.S. PAT OFF

The New England Mica Company of Waltham, Massachusetts, announces the appointment of H. M. Thomas Company, San Francisco, as the representative in California for their complete line of mica insulations.

No. 1 India Plate	Y-26 High-Heat Mica Plate
No. 11 India Plate	No. 7 India Heater Plate
No. 2 India Plate	No. 8 Amber Heater Plate
No. 22 Unmilled India Plate	Commutator Segments
No. 3 Amber Segment Plate	Commutator Rings
No. 4 Flexible Plate	Mica Tubes
No. 5 Mica Cloth	Cut Mica
No. 6 Mica Paper	Mica Washers

New England Mica Company
Waltham, Massachusetts

Representative in California

H. M. Thomas Company
589 Howard Street, San Francisco

Dilecto
Red Stripe

THE possibilities of Dilecto are without end in the electrical field. It possesses every needed qualification for equipment or appliance insulation.

Always uniform and dependable. Replaces to advantage fittings of wood, rubber, leather, porcelain, mica, glass and metals.

Electrical men not thoroughly familiar with Dilecto advantages will be interested in "Insulation"—it contains many important facts about Dilecto, Contex, Conite and Continental Vulcanized Fibre. Consult with a Continental engineer—he can help you!

THE CONTINENTAL FIBRE COMPANY
Factory: Newark, Delaware

Service on Dilecto, Conite, Contex and Vulcanized Fibre, from:

NEW YORK, 250 Park Ave.
CHICAGO, Wrigley Bldg.
PITTSBURGH, Farmers Bank Bldg.
SAN FRANCISCO, 75 Fremont St.
SEATTLE, 1041 Sixth Ave. So.
LOS ANGELES, 307 So. Hill St.

Catalog Printing

requires special equipment, and thorough knowledge of the requirements needed for this particular class of business. We can handle your catalog in its entirety in our plant.

Filing Cabinets
Loose Leaf Devices
Card Files
Stationery
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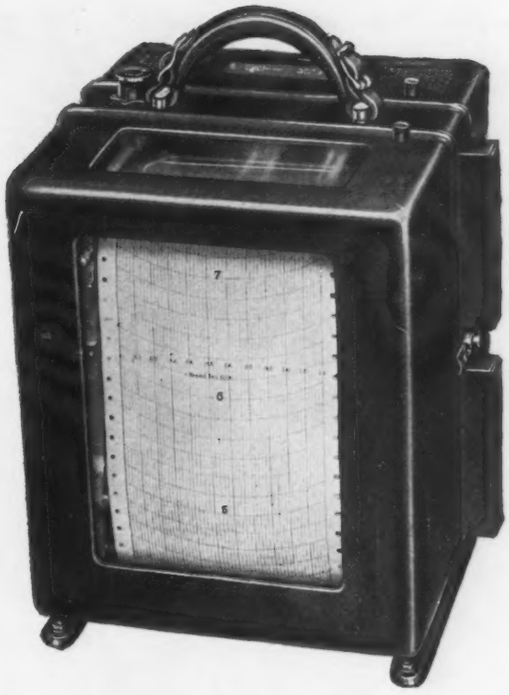
Lithographed
Engraved
Carbon Paper
Miscellaneous
Office Supplies

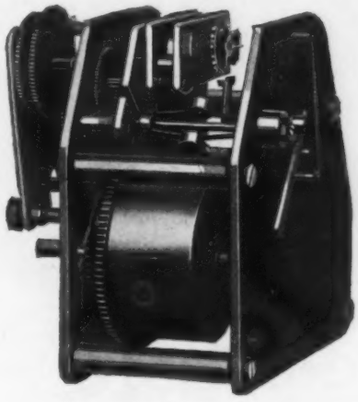
Let us demonstrate what we can do for you—at your convenience.

Kalamazoo Catalog Covers

that are different, that allow the sheets to be changed with the minimum amount of effort.

NEAL, STRATFORD & KERR
The Best in Stationery
521 Market St. San Francisco
Phone Sutter 5886





A Superior Drive

One of the most important features of these instruments is the means of obtaining a constant relative movement of the record roll.

The CP-4 uses a high-grade Chelsea eight-day clock, which drives the record roll through a set of reduction gears. This clock is designed to meet the special requirements of a recording instrument: it has the power necessary to insure good timekeeping qualities at all paper speeds; it has an escapement capable of controlling the power of the main spring when the clock is operating the record roll at slow speed, and practically no load is imposed on the clock when it is operating at high speed.

In the CP-5, the roll is driven by a Warren synchronous motor actuated from a separate circuit of known frequency.

Their designers knew requirements

The requirements that must be met by portable recording instruments are much more exacting than in the case of corresponding stationary, or switchboard, types. Portables must be lighter and more compact and have multiple voltage ranges; they must be able to stand much rougher treatment, both physical and electrical; and they must maintain under adverse conditions even a higher degree of accuracy and dependability than is usually expected from the switchboard type.

These instruments, types CP-4 and CP-5, have been designed with a thorough understanding of these requirements. Their manufacture is marked by skill, by workmanship of the first class; and the resulting product is of very high grade—typically General Electric.

Made in:

Ammeters
Voltmeters
Wattmeters
Power-factor Meters
Frequency Meters

Described in Bulletin GEA-304

610-7

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

JEWELL

Accurate and well designed tools are essential in the manufacture of measuring instruments. Where clearances are close Jewell tool makers must build punches, dies, jigs and special tools, with exceptionally small tolerances.

Instrument mechanism that insures accuracy under all conditions

Wattless current or "electrical froth", as it was recently called, is costing the country a large sum. When reducing idle current losses and raising the power factor of your load, you should install the proper measuring instruments.

The Jewell power factor meter on the crossed coil dynamometer principle with its proven features of stability and accuracy of indication assures accurate power factor measurement.

JEWELL ELECTRICAL INSTRUMENT CO.
1650 Walnut Street
CHICAGO, ILL.

EVERHOT
ELECTRIC WATER HEATING

The development of the EVERHOT Electric Heating unit opens up a wide field of prospective new customers who want this simple and most convenient method of water heating in their homes.

Ready for installment in complete outfits with tank, or for application to tanks already installed.

Let us send you complete information of sizes and prices.

Everhot Electric & Mfg. Co.
116 Llewellyn St. Los Angeles, Calif.

WEATHERPROOF
WIRES CABLES

CALIFORNIA WIRE

It pays to get acquainted with "California Wire"

California Wire & Cable Co.
EXECUTIVE OFFICE
Orange, Calif.
PLANTS AT
Orange CALIF. Oakland

BARE AND INSULATED WIRES

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

"OK" Weatherproof Wire
"Parac" Rubber Wire
Slow Burning Wire
Bare Copper Wire

PHILLIPS WIRE COMPANY
Pawtucket, R. I.

Meticulous Care in Buying All Equipment Brought Them to Packard

The company which bought this installation of three 200 K.V.A. Packard power transformers is noted for the care with which they buy every piece of equipment—however small—however large.

They do not buy "just equipment"—never—they insist upon—they demand—quality to the maximum degree.

Packard reputation for "Honest Value" naturally appealed to them, just as it always appeals to the many firms which correctly evaluate quality.

The Packard Electric Co.

WARREN, OHIO

Offices in Principal Cities

Packard is never seen, except on goods of honest value

Western Representatives

A. J. MYERS CO.,
611 Howard St., San Francisco

W. W. LA BARR
533 Chamber of Commerce Bldg.,
Los Angeles

T. S. WOOD
505 Polson Bldg., Seattle

Trim in comfort Limbs and Safety

No crawling around in tree tops—no chance for contact with deadly high-voltage if linemen are equipped with Bartlett Insulated Tree Trimmers.

No chance of trouble, even if bead comes in contact with line. Trimmers insulated with Bakelite, tested to 105,000 volts.

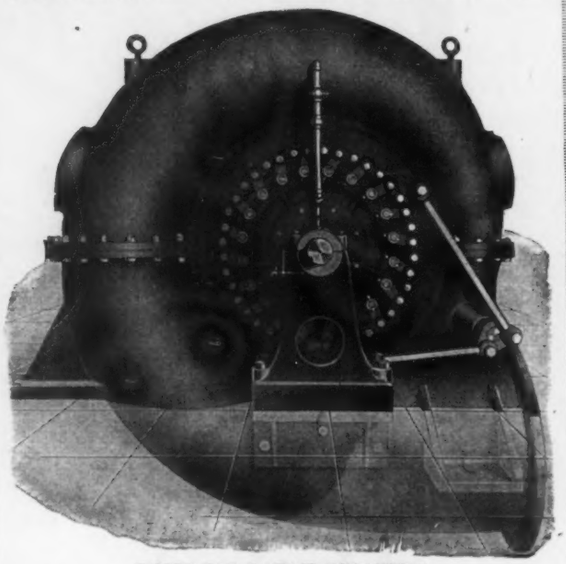
Compound lever knife will easily cut a 1½-in. limb. Best basswood or airplane spruce poles. Lengths up to 16 feet—extra sections extend to almost any length desired. Aluminum sleeve locks the pole securely to the extra section. We suggest 12-foot top section and ¼-foot section with aluminum sleeve.

Bartlett Tree Trimmers are now standard with hundreds of Light and Power Companies and seven Bell Telephone Companies.

Bartlett Manufacturing Co.
443 E. Lafayette Ave.
Detroit, Mich.

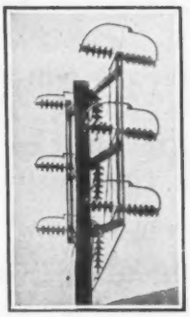
Represented by Ben C. Holst, Rialto Bldg., San Francisco, Calif.

LEFFEL
TURBINE WATER WHEELS



WRITE FOR LATEST BULLETINS

The JAMES LEFFEL & CO.
SPRINGFIELD, OHIO

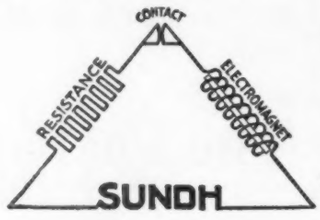


FOR SECTIONALIZING—Specify K-P-F Switches. Manufactureed for any voltage. On large hydro-electric developments you will find extensive use of K-P-F high tension switches. They were developed to meet the demand for simple inexpensive switches which could be installed in the circuit at a minimum cost and with little interruption on the line.

Each unit is self-contained. Switches are shipped complete, ready to bolt to crossarm. Also suitable for steel tower mounting. Write for bulletin 105.

K-P-F ELECTRIC CO.
855-859 Howard St., San Francisco

THE ELEMENTS OF OUR BUSINESS



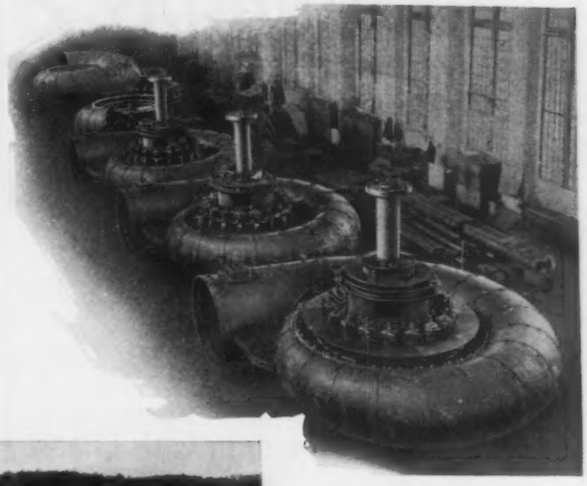
Automatic Starters
Circuit Breakers
Float Switches
Hand Starters
Magnet Switches
Pressure Regulators
Remote Switches
Speed Regulators
Transfer Switches
Valve Control

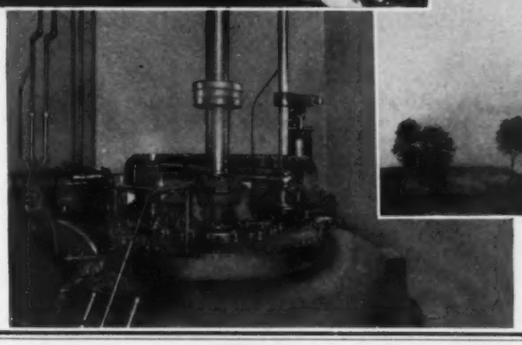
Write for Catalog

THE DEMMERT COMPANY
LOS ANGELES, 106 W. 3 Street
SAN FRANCISCO, 74 New Montgomery St.
Sales Representatives for
SUNDH ELECTRIC CO., Newark, N. J. Products

80,000 Horse Power in SMITH HYDRAULIC TURBINES

at DON PEDRO PLANT of TURLOCK IRRIGATION PROJECT and HORSE MESA DEVELOPMENT of SALT RIVER VALLEY WATER USERS ASSOCIATION as here illustrated



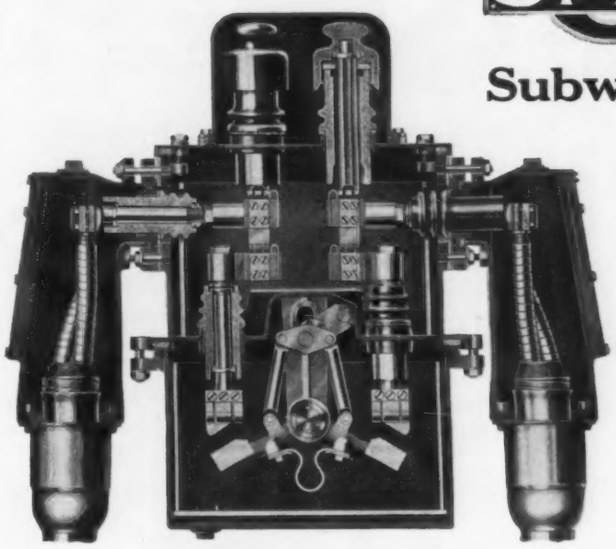


If interested in water power development, submit your problems to our Dept. "H."

S. MORGAN SMITH CO.
San Francisco Office
461 Market St.
YORK, PA.

G & W SPECIALTIES

Subway Oil Disconnects



SUBWAY OIL DISCONNECTS
Showing manual air break above the oil chamber, the cable heads at each side for compounding, and the protecting iron hood over the disconnects.

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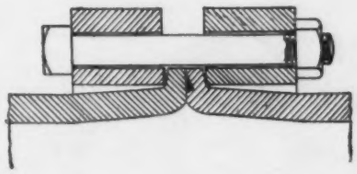

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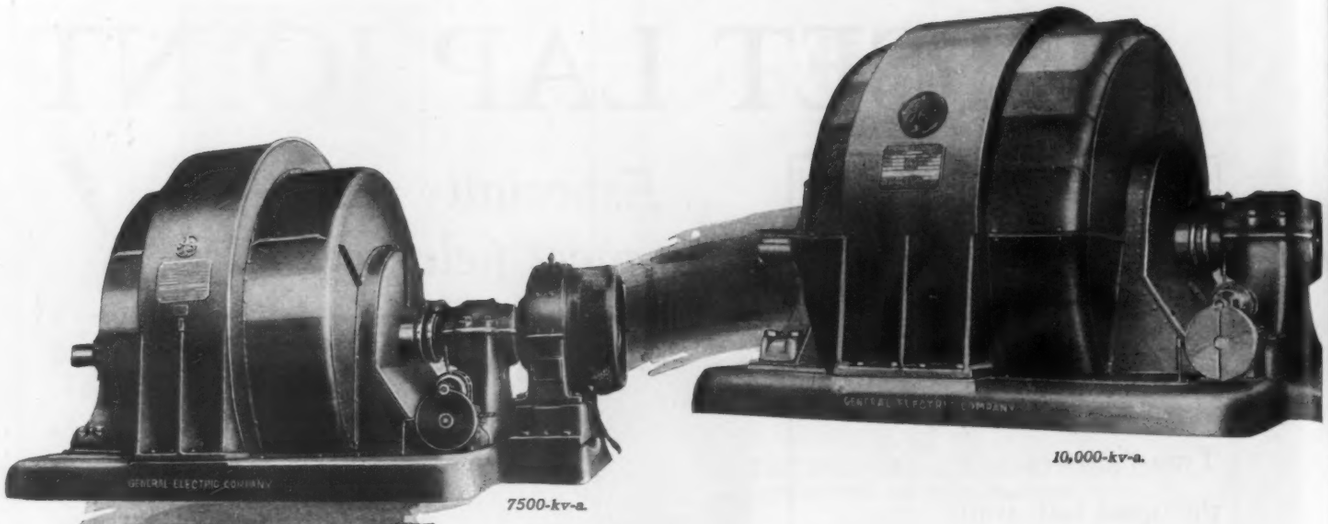

10,000-kv-a.

7500-kv-a.

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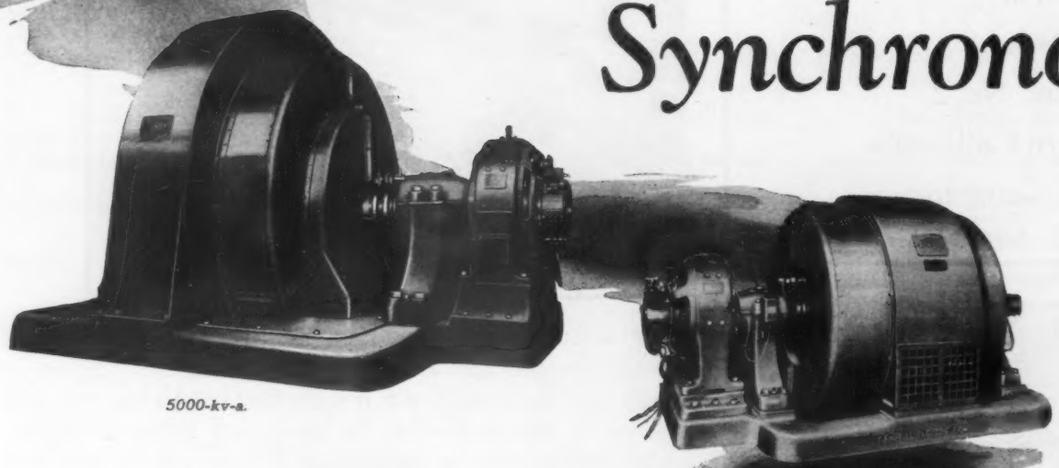
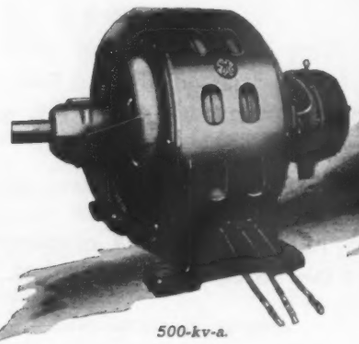


5000-kv-a.

1500-kv-a.



500-kv-a.

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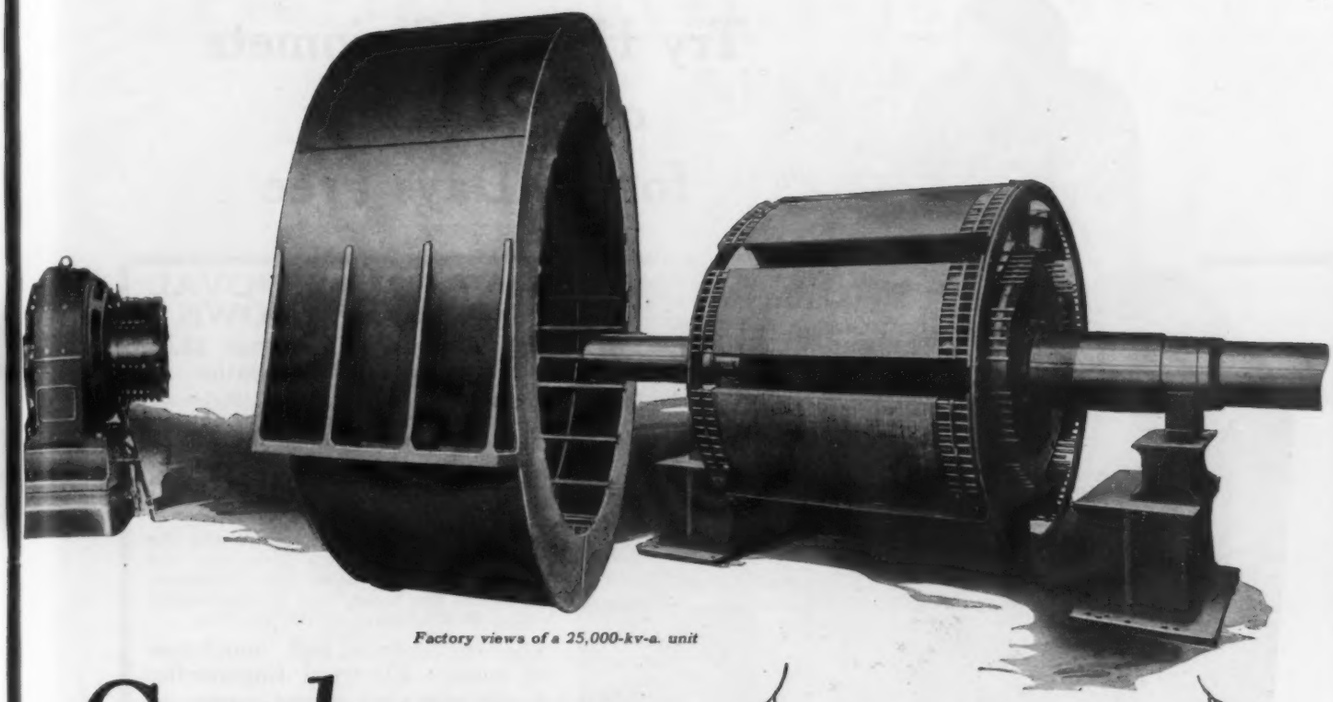

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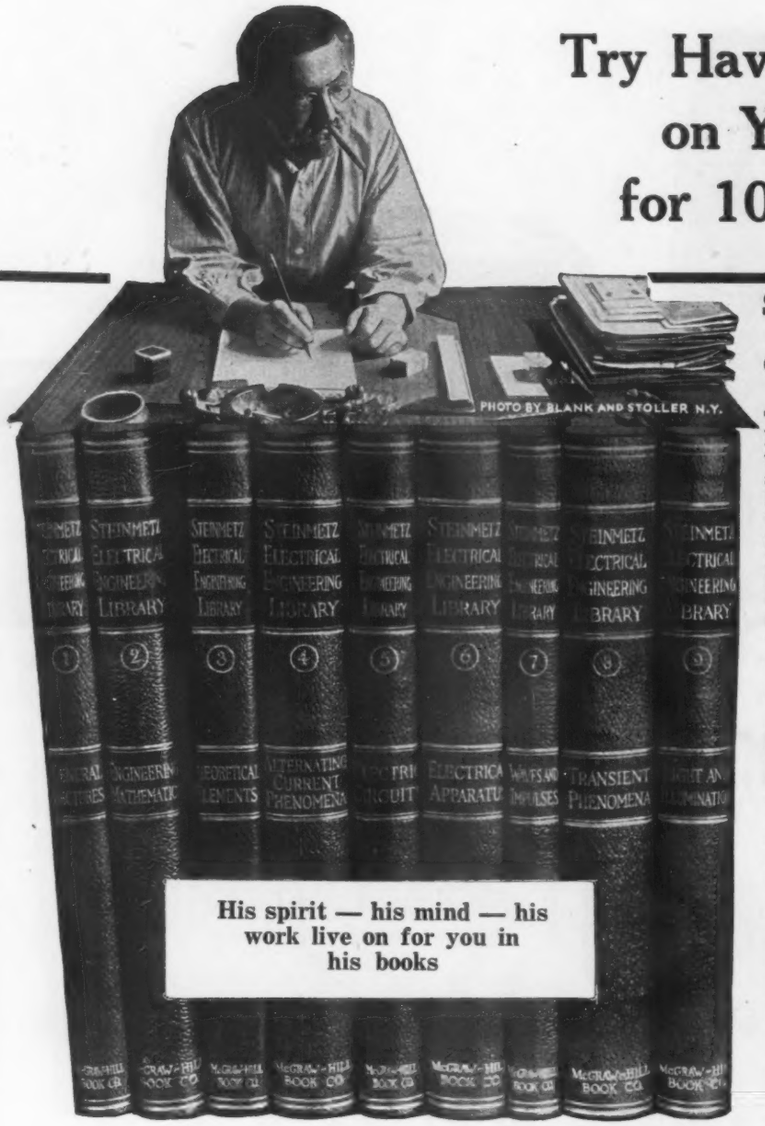

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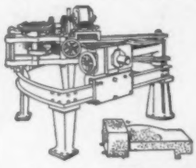

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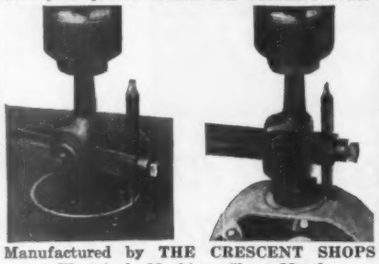

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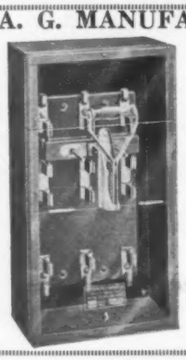

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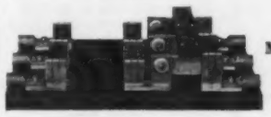

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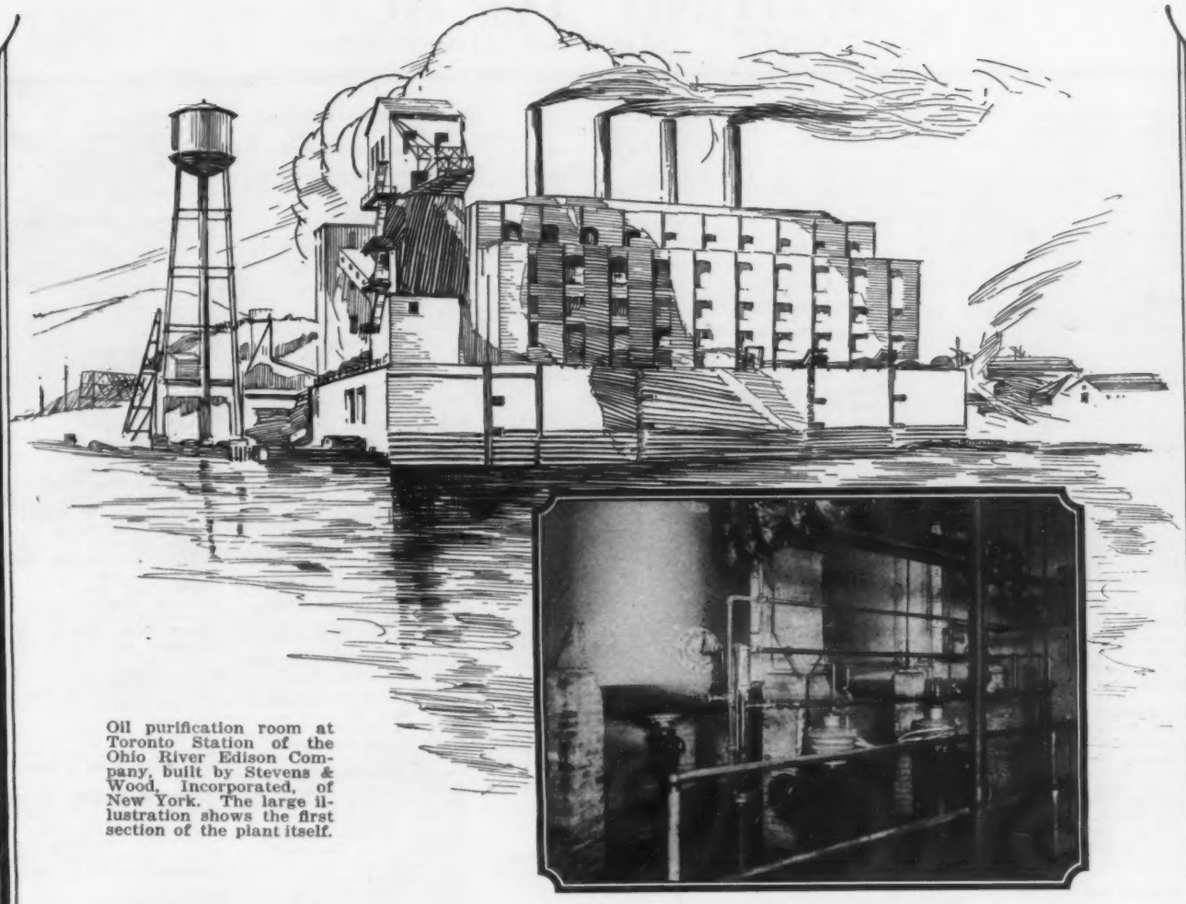

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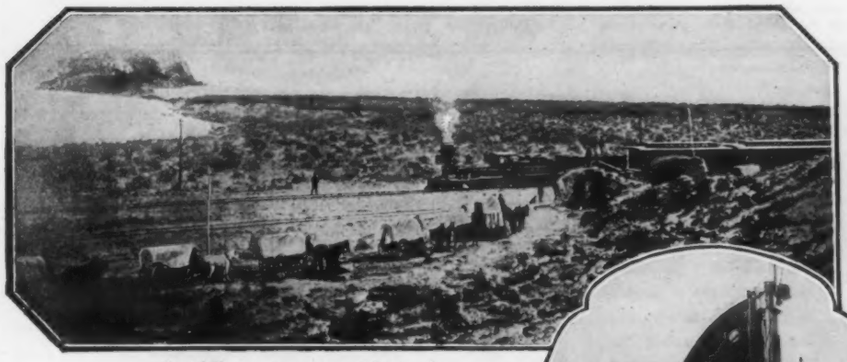
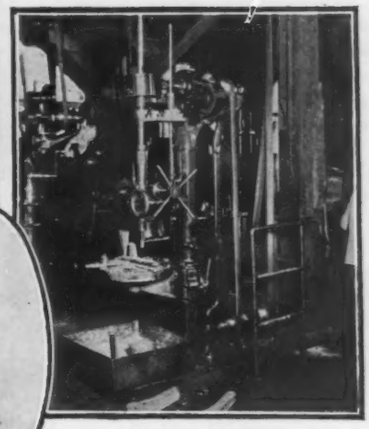


Special Train on way to Scene of driving of "Gold Spike"—May 10, 1869



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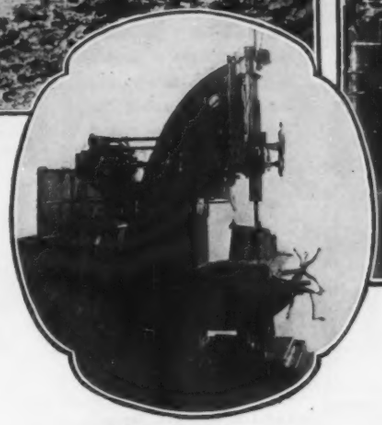

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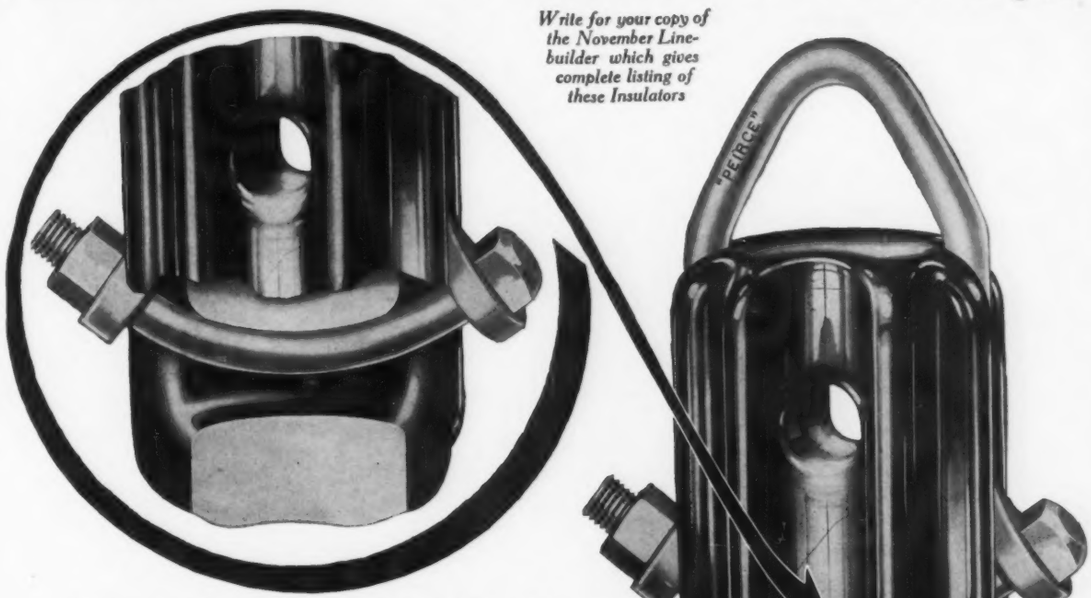
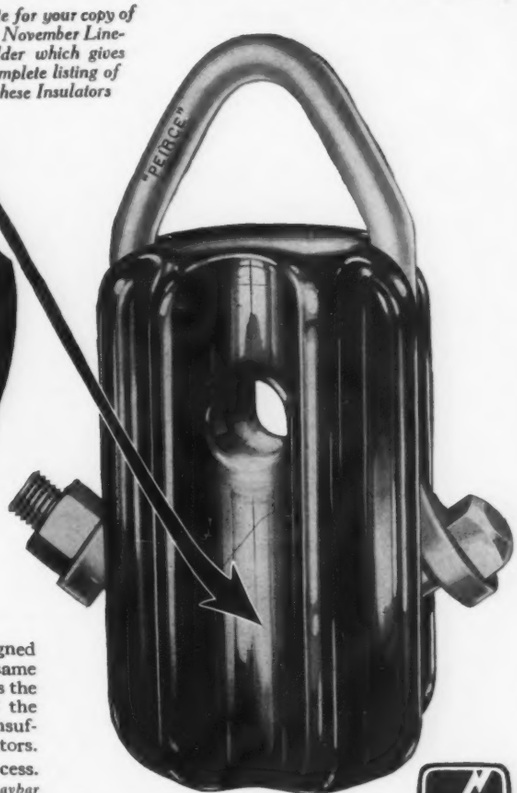


Cutaway section of Peirce Insulator showing wide bearing surface of the bolt on the Insulator



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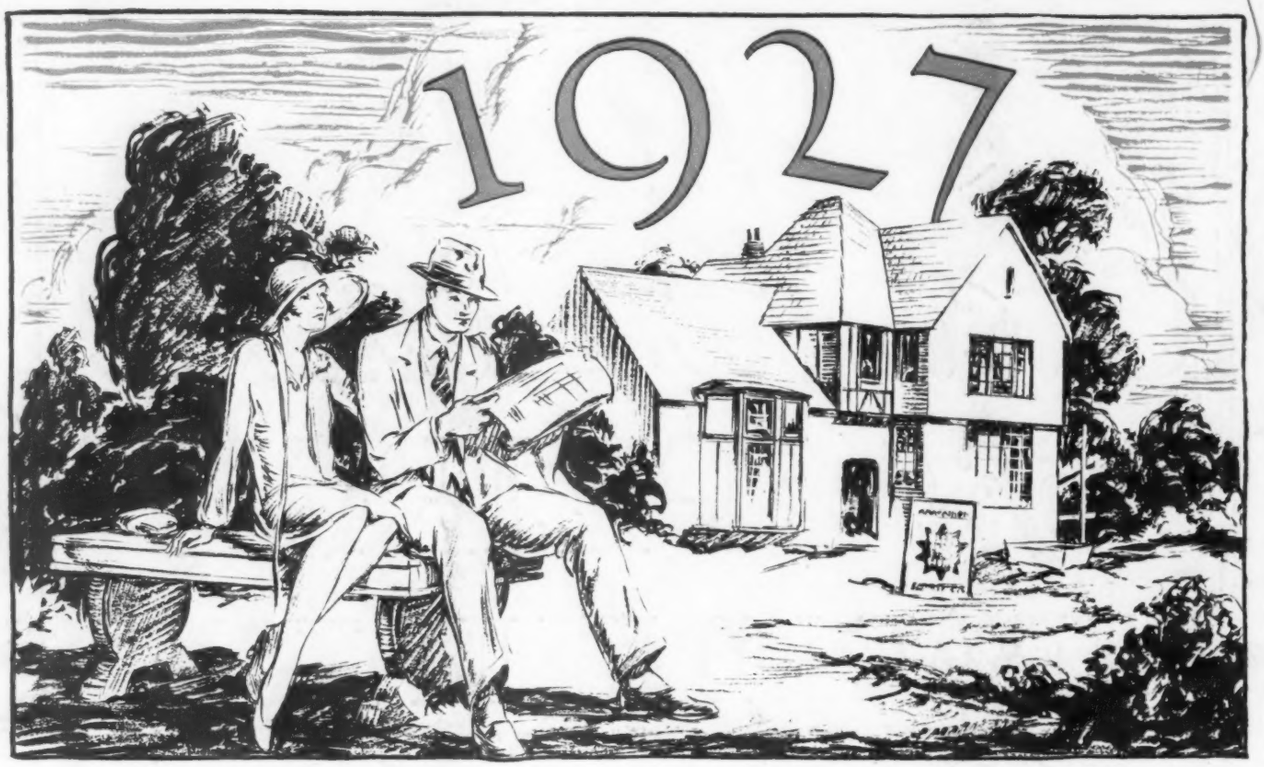

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